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ABSTRACT

The effectiveness of using computer courseware developed for adults reading below the fourth-grade level was investigated with inmates at Rockview State Correctional Institution. Data were collected both to establish multiple baseline data and to permit experimental group comparison with a control group. The multiple baselines portion of the study involved 11 male inmates with reading levels of 0-4 who completed 18-25 hours of work with the courseware. The Wide Range Achievement Test (WRAT) and the Slosson Oral Reading Test (SORT) were used as pre- and posttests. The courseware was considered effective. Testing 10 months later showed that students' retention level was about 90 percent. In the experimental/control group portion of the study, 27 inmates were tested with 2 sections of the Baltimore County Design, the Bader Reading and Language Inventory, the SORT, and a test of incidental learning of computer words. The experimental group each used the courseware for 10-22 hours whereas the control group received small group and tutorial instruction using traditional beginning materials for adult reading instruction but was not exposed to computer-assisted instruction. The 23 men who completed the work were given posttests using the same measures used for the pretests. Analysis of variance for repeated measures was used to analyze the test differences. The only measure that showed a statistically significant difference was the Bader Reading and Language Inventory. The control group showed no improvement on the posttest measure and had fallen behind the experimental group at that time, even though they had started out at a higher level. (Two references and three tables are included.) (CML)

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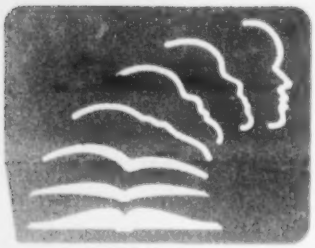

INSTITUTE FOR THE STUDY OF ADULT LITERACY

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FINAL REPORT

Evaluation of Computer Courseware for Adult Beginning Reading Instruction in a Correctional Setting

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August 30, 1986

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Abstract

The computer courseware that exists for Adult Basic Education assumes at least a fourth grade reading level. Yet the greatest need for individualized instruction is at the beginning reading levels. Hence, the development of computer courseware designed to teach recognition of 1000 high frequency words and functional vocabulary was funded in the Fall, 1984 by the Pennsylvania Department of Education for those adults functioning in reading below a fourth grade level.

Since the courseware development project is a product of The Pennsylvania State University's Institute for the Study of Adult Literacy in the College of Education, it seemed appropriate that the effectiveness of the courseware should be carefully evaluated. In July 1, 1985-June 30, 1986, such an evaluation was funded by the Pennsylvania Department of Education, 310 Adult Basic Education Special Project. A rigorous evaluation of the courseware was conducted at Rockview State Correctional Institution near Penn State University. The objectives of this project were achieved; the courseware evaluation results are reported herein.

Concurrently with the evaluation, the courseware development project was being continued with funds from the Pennsylvania Department of Education Chapter I. The development process is complete as of September, 1986. During 1986-87, the courseware is undergoing evaluation with parents of children enrolled in Chapter I compensatory education programs throughout Pennsylvania. A version with interactive audiodisk using human voices is also being developed especially for non-native speakers with funding from Chapter I. The results of these efforts will be available from Penn State University's Institute for the Study of Adult Literacy in August, 1987.

The courseware in the present version using a speech synthesizer is available at cost from the Institute for the Study of Adult Literacy, The Pennsylvania State University, 203 Rackley Building, University Park, PA 16802 (814/863-3777).

FINAL REPORT: EVALUATION OF COMPUTER COURSEWARE FOR ADULT BEGINNING READING INSTRUCTION IN A CORRECTIONAL SETTING

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INTRODUCTION

Computer-Assisted Instruction (CAI) courseware was developed during the 1984-86 fiscal years with funding from the Pennsylvania Department of Education, Chapter I and 310 Adult Basic Education Special Projects. This courseware uses a "whole word" approach with some word building activities in teaching 1,000 high frequency and functional words to adult beginning readers. The goal is expanded word recognition for adult non-readers. The courseware is interactive, branching and responding to the user's answers and needs. The courseware runs on an Apple IIe microcomputer with two disk drives, color monitor, printer, and a speech synthesizer (Echo GP). The courseware consists of 28 disks which deliver the instructional program and record student responses.

The courseware begins with a module on computer usage, especially acquainting the student to the speech synthesizer, the commands, and the letter/number keys. Reading vocabulary has been divided into two categories: picturable and non-picturable words; these are further divided into groups of ten words (or word sets in a lesson). Picturable words are introduced with a graphic while non-picturable words are introduced using short selections on a variety of topics. The words are taught in context with multiple choice and completion exercises to practice recognition of the target words. Games are used to reinforce the acquisition of new vocabulary.

The student is pretested before each lesson with 90% set as mastery level. If mastery is not attained, the student is directed to the instruction and games to help him/her learn the vocabulary. The student is posttested upon completion. Ten forms of each test exist. The courseware uses branching to permit review and reinforcement. An elaborate record-keeping system records and analyzes responses, number of attempts, and response time. A file editor disk allows the instructor to monitor a student's progress.

During the 1985-86 fiscal year, the use of the courseware was evaluated at the Rockview State Correctional Institution. The target population consisted of male prison inmates at the 0-4 reading level. Because this group had not learned to read using conventional methods of teaching, a new approach seemed desirable.. The computer offers a novel vehicle for learning to read. Innovative approaches have been recommended by Hunter and Harman (1979) and others in teaching reading to those who have many problems in addition to illiteracy.

This project involved two phases of evaluation: a multiple baseline study and a group comparison study. Each of these will be described separately.

MULTIPLE BASELINE STUDY

This study used a single subject, multiple baseline design across behaviors (i.e, word sets). The subject and condition were held constant. Each baseline phase corresponds to a different set of words being taught to the subject.

Permanent product recording was used to identify a baseline and show changes in that baseline. Two types of permanent product data were collected: the number of correct items in a pre-/posttest and the time to criterion (i.e., the average amount of time required for a correct response in a pre-/posttest). Both sets of data are presented graphically in order to analyze a subject's performance.

This phase of the evaluation was conducted in the Special Education classroom in the education building at Rockview State Correctional Institution. Four computer

stations were set up in the room. These were arranged in pairs at opposite ends of the room. Each station was equipped with an Apple IIe microcomputer, an Echo GP speech synthesizer, and headphones.

All of the subjects were enrolled in classes for beginning levels of reading instruction although none had attended any Adult Basic Education (ABE) classes outside the prison. None of the subjects had previous computer experience.

The Wide Range Achievement Test (WRAT) had previously been administered to them as a part of routine prison procedure. The reading subtest and the composite score are, therefore, reported as global measures of reading ability.

The Slosson Oral Reading Test (SORT) was used as a measure of sight word recognition. This test consists of word lists which the subject is asked to read. The score is reported as a reading level. According to the technical information available with the SORT, this test has a rater/inter-rater reliability coefficient of .99.

Three of the students spoke Spanish as their first language and English as their second language. The Language Assessment Battery (LAB) was used with these men. The LAB has parallel forms in English and Spanish; by comparing a subject's results on both tests, one can determine which language is stronger for that individual.

Procedures

Each student completed a series of introductory lessons. Following this step, each student was allowed to choose the three lessons which would be identified as his target lessons. Each target lesson began with a series of pretests which were administered by the microcomputer. For each lesson (word set) a thirty-item test was administered; by varying the order of the items, ten different forms could be produced. The first twenty items in each test followed a multiple choice format. The speech synthesizer read the sentence to the student. The student was asked to type the number of the words he selected. The last ten items followed a completion

format. Again, the speech synthesizer read the sentence to the student. In these items, a word bank with the ten words taught in that lesson was provided on the screen as the student typed the missing word in the sentence.

No feedback was given during the test until the end of each section when a subject was told his score for that part. At least three forms of the pretest were required to establish a baseline of a student's ability to read a set of words.

Within each lesson, the words were introduced in a short selection which was read by the speech synthesizer. The students were allowed to hear the selection again at any time during the lesson. A student completed the lesson at his own pace. After the instructional and practice sequences, a student encountered criterion frames which were used to assess his progress. Based on his responses to these criterion frames, the student was allowed to go on to the practice games or was recycled through parts or all of the lesson.

A variety of games were used to practice the recognition and spelling of the target words. The students could choose the games they wished to try. Following the games, a series of posttests were administered. Each student was required to complete at least four forms of the posttest to measure his new level of performance. The posttests were merely different forms of the thirty-item pretest.

The men were scheduled for sessions of one hour per day for five days per week for a six-week period. Although the men were to unable to attend all of the sessions, each completed 18-25 hours of work with the courseware. During the time the students were working with the courseware, the researcher or a trained assistant was available to answer questions.

The data from this phase are presented by the student. A brief description of each student is given, followed by three graphs showing his performance. In addition to plotting his scores in each pre and post intervention phase, a horizontal dotted line representing his mean score for each phase is also plotted. This allows a quick

evaluation of the changes that occurred as a result of the intervention. These mean scores are summarized in Tables 1, 2 and 3 in the Appendix.

Results

Student A

Student A was a 29 year-old black male from an urban home. He was monolingual in English and had completed the ninth grade in school. He had completed about two months of ABE classes at the prison. His WR .T reading subtest score was 3.0 while his composite score was 2.8. His SORT grade level score was 2.1. He completed 23 hours of work with the courseware.

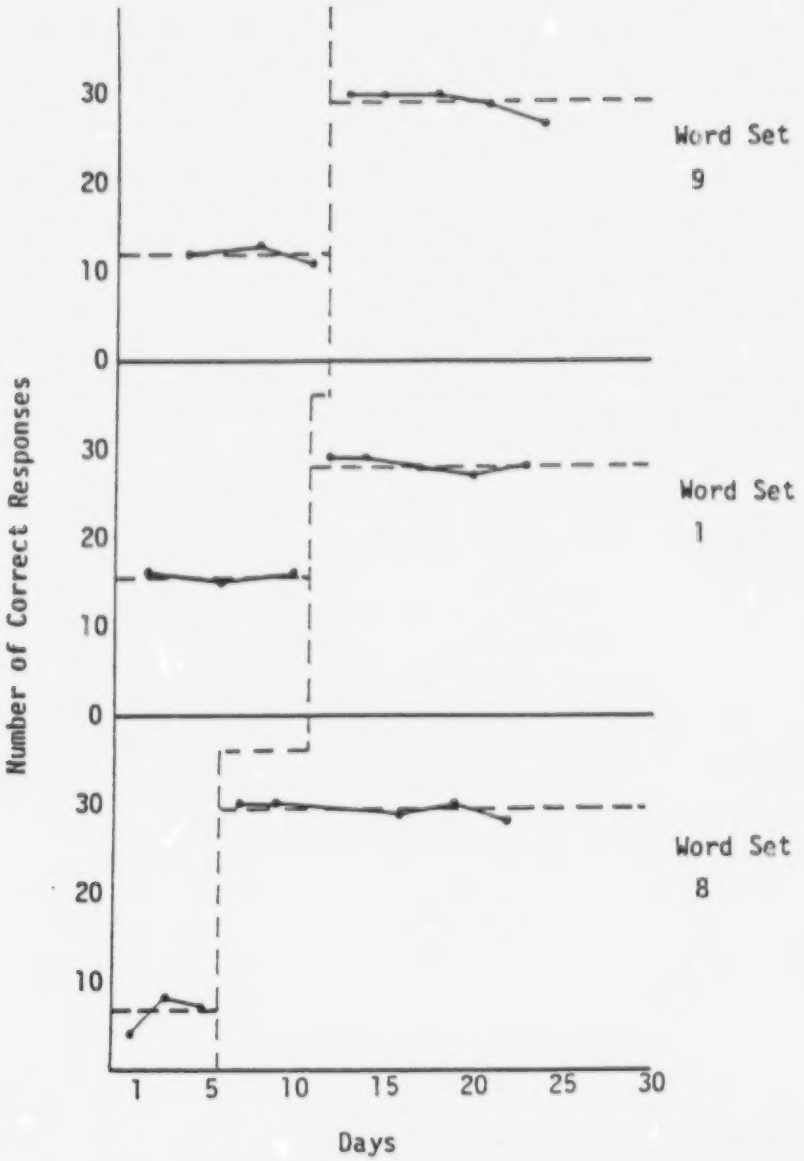

Figure 1: Student A: Number of Correct Responses

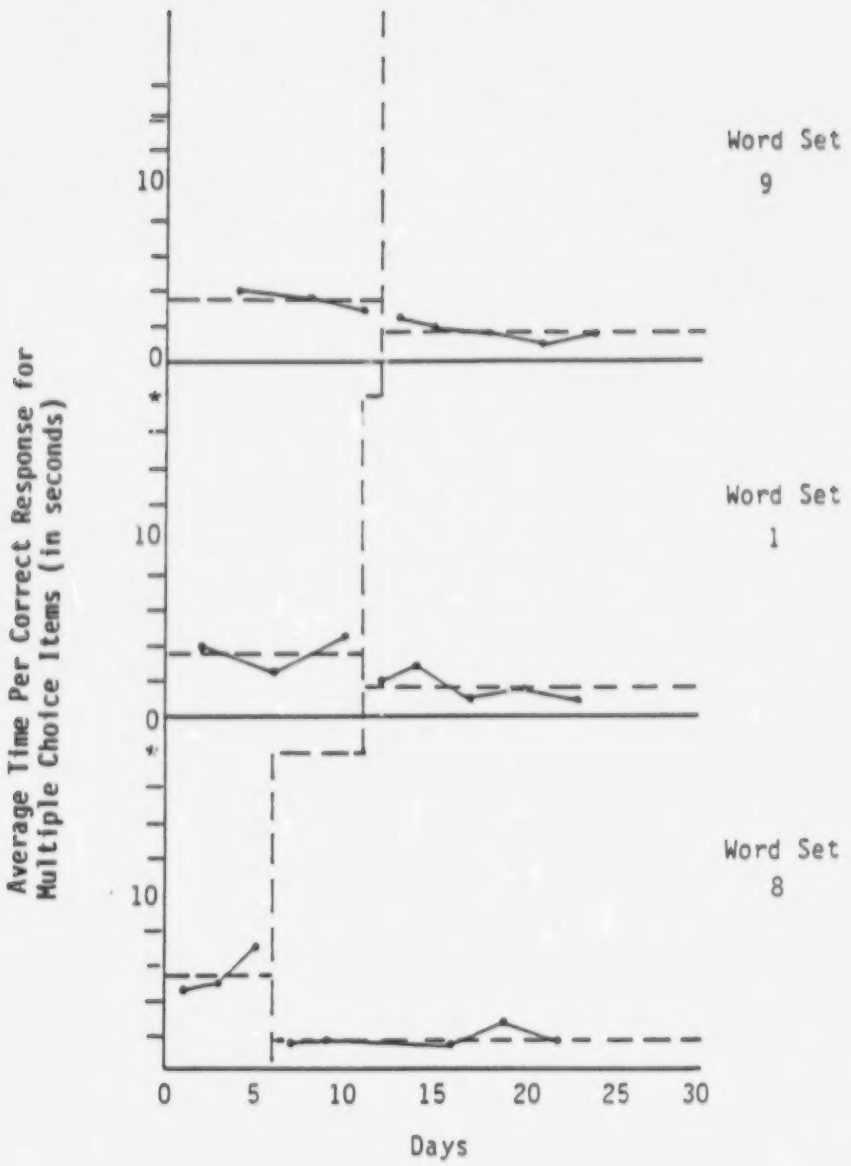

Figure 2: Student A: Average Time-Multiple Choice Items

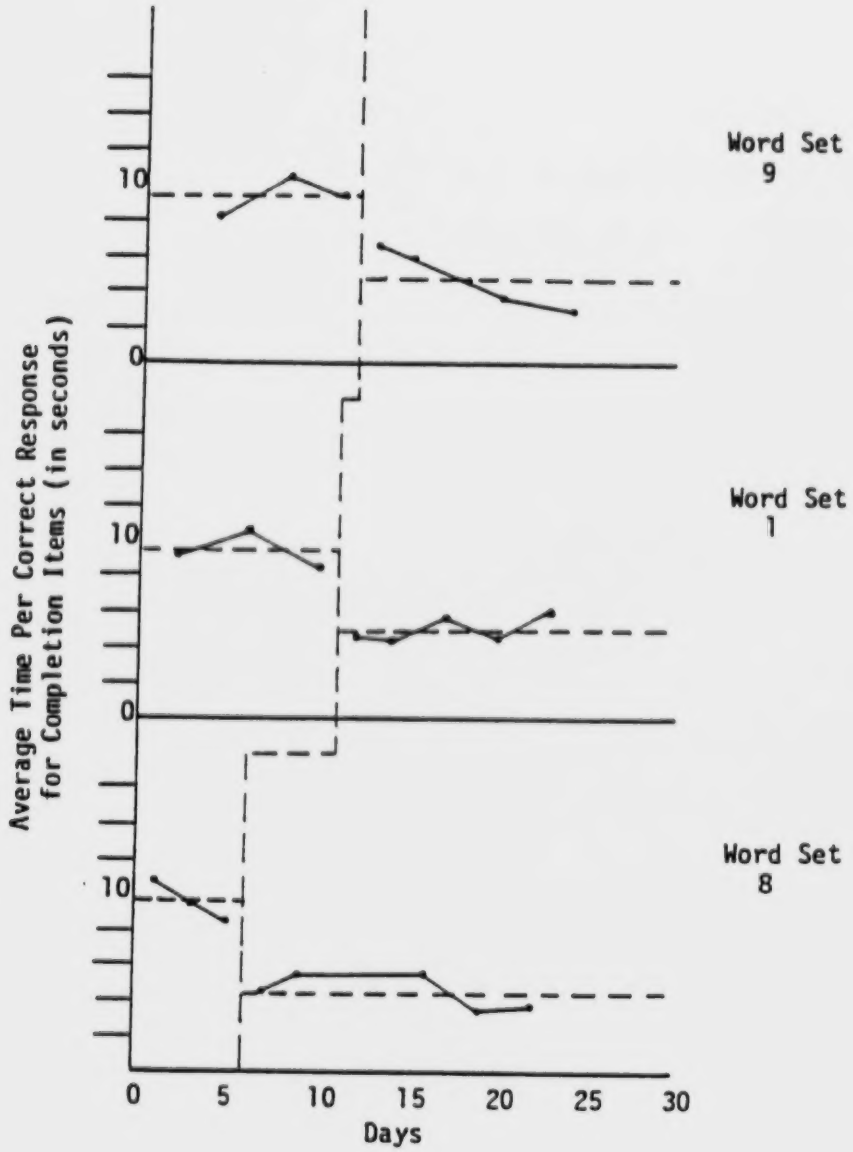

Figure 3: Student A: Average Time - Completion Items

Student B

Student B was a 32 year-old black male from an urban home. He was monolingual in English and had completed the third grade in school. He had completed about eight months of ABE classes at the prison. His WRAT reading subtest score was 3.4 while his composite score was 3.0. His SORT reading level score was 3.8. He completed 18 hours of work with the courseware.

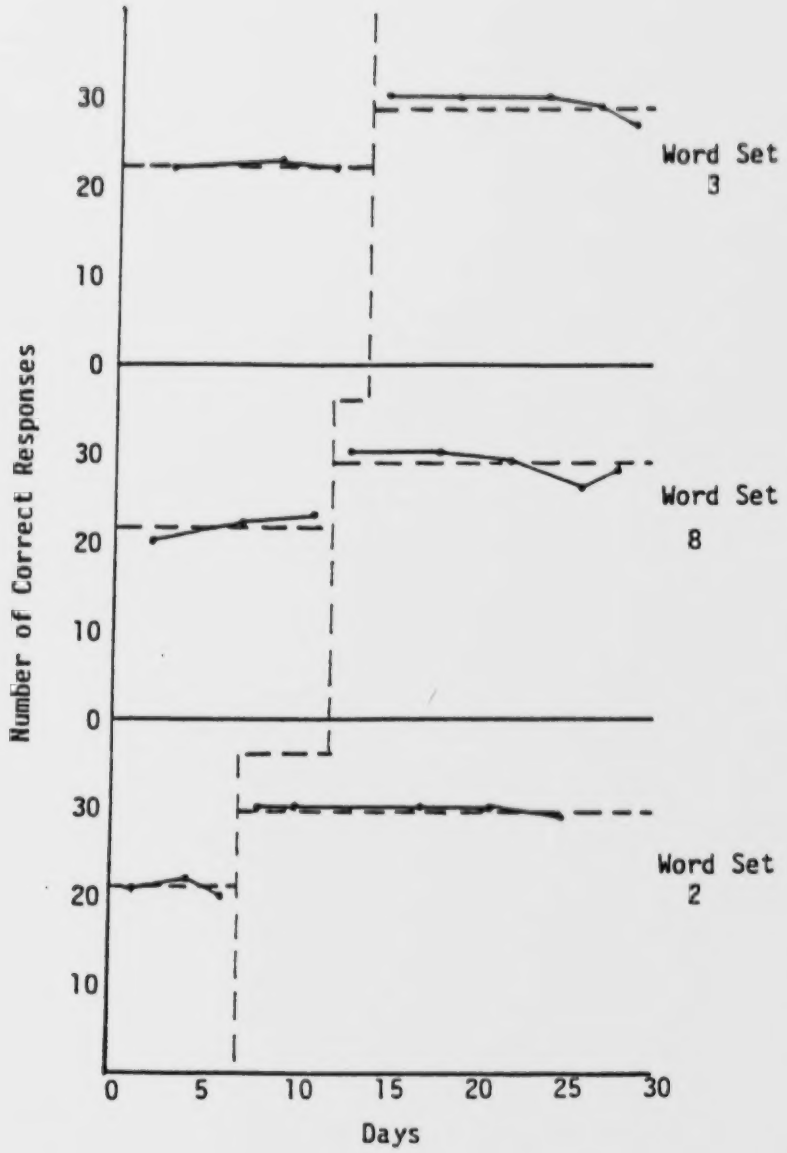

Figure 4: Student B: Number of Correct Responses

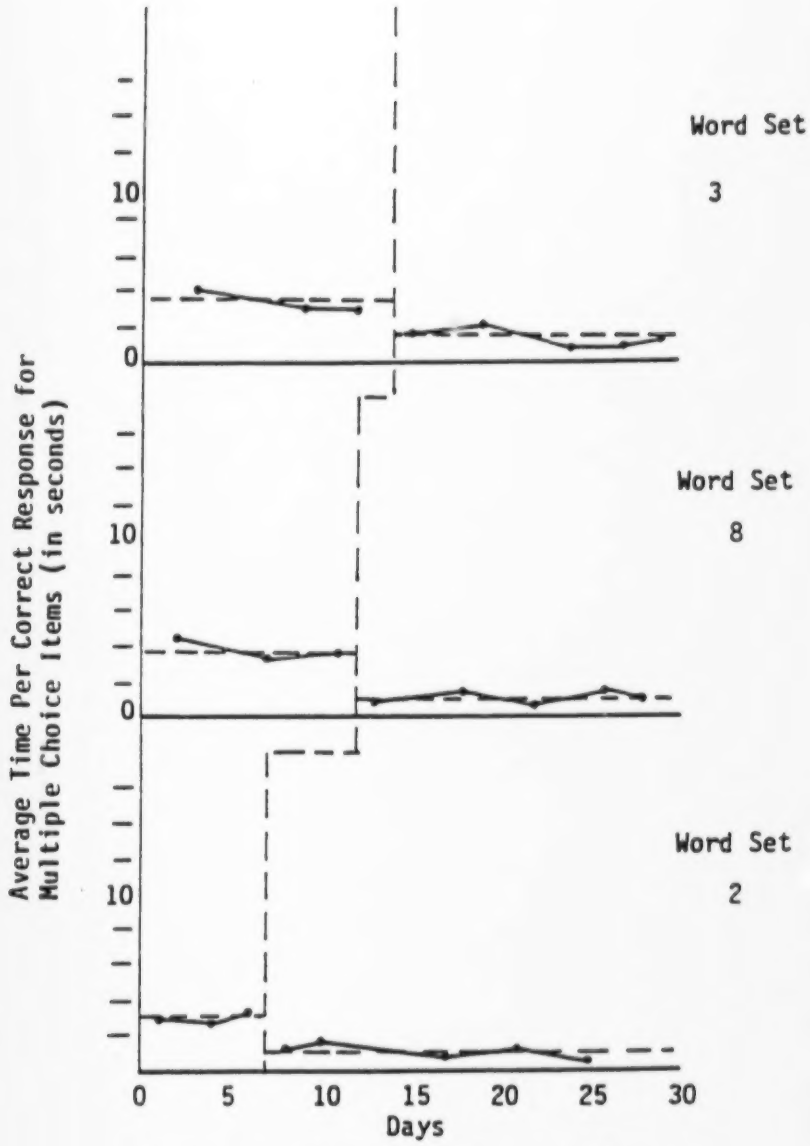

Figure 5: Student B: Average Time-
Multiple Choice Itmes

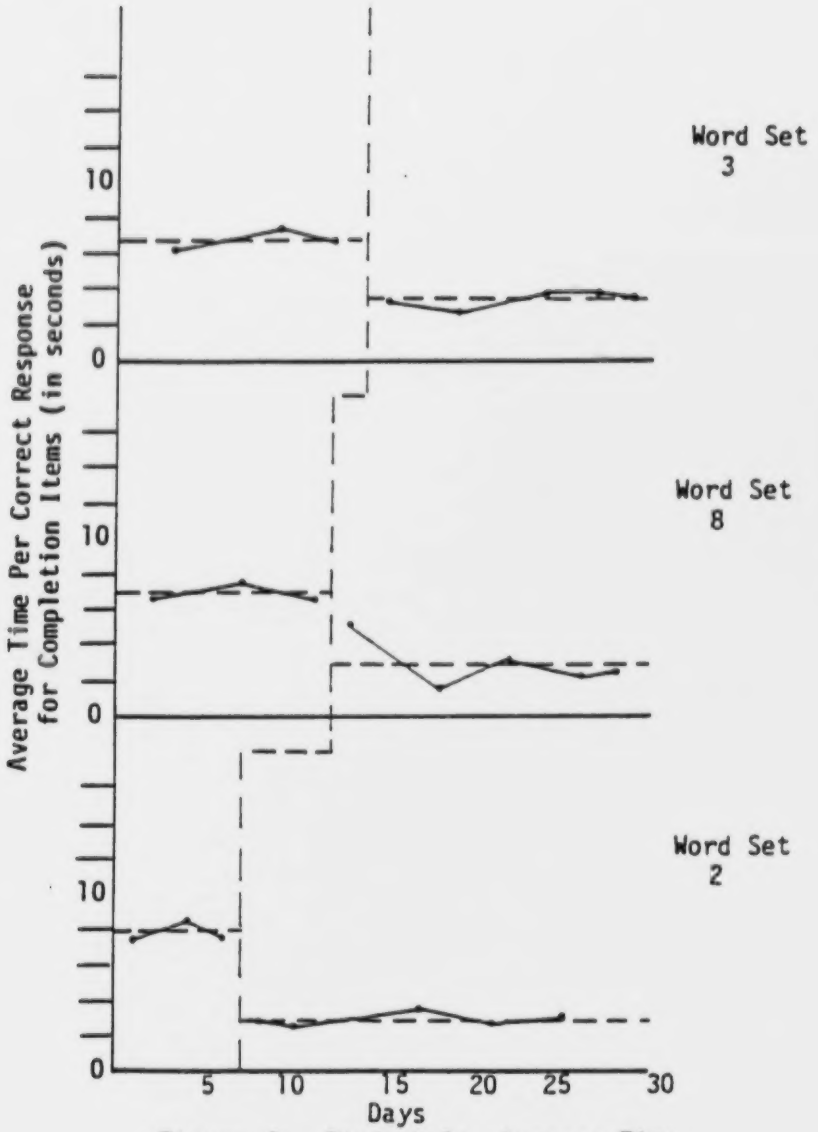

Figure 6: Student B: Average Time
Completion Items

Student C

Student C was a 35 year-old white male from an urban home. He spoke Spanish as his home language and English as a second language. According to the LAB, Student C's reading skills in Spanish were stronger than those in English. Using the Level II form of the test, he performed in the ninth stanine in Spanish and in the third stanine in English. He had completed the ninth grade in school. He had attended about four months of ABE classes at the prison. His WRAT reading subscore was 3.3 while his composite score was 3.5. His SORT grade level score was 1.7. He completed 25 hours of work with the courseware.

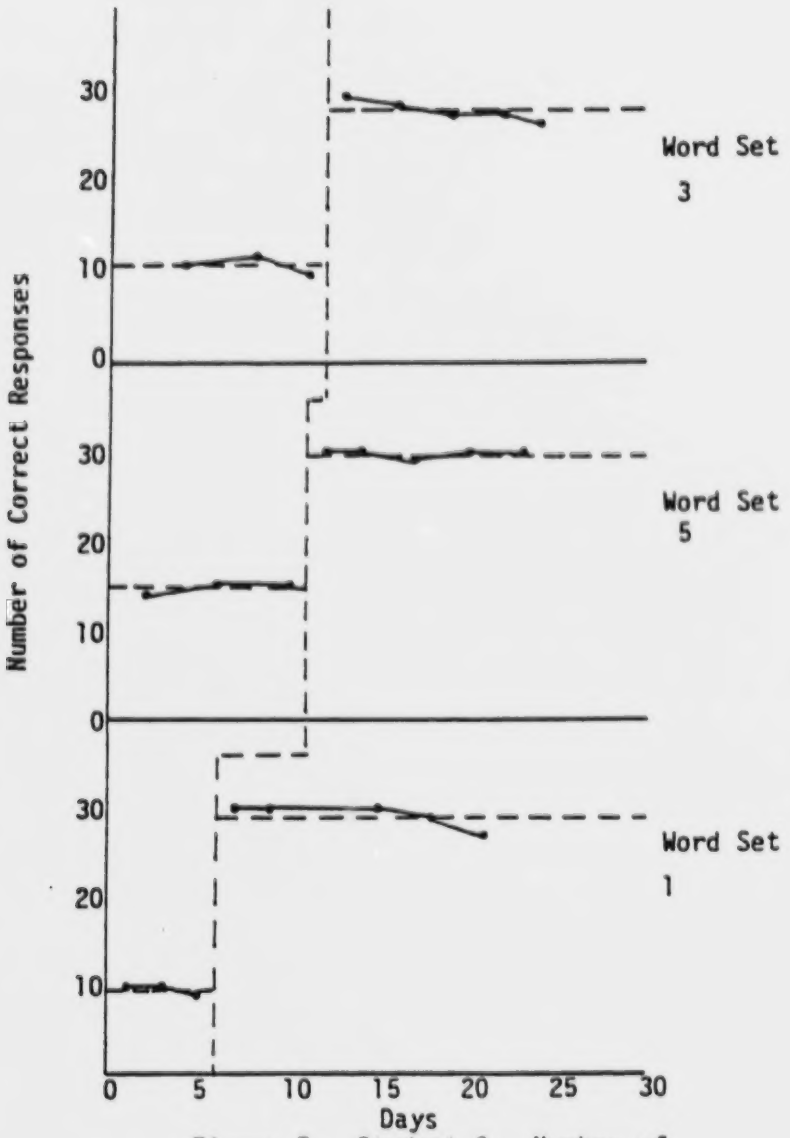

Figure 7: Student C: Number of Correct Responses

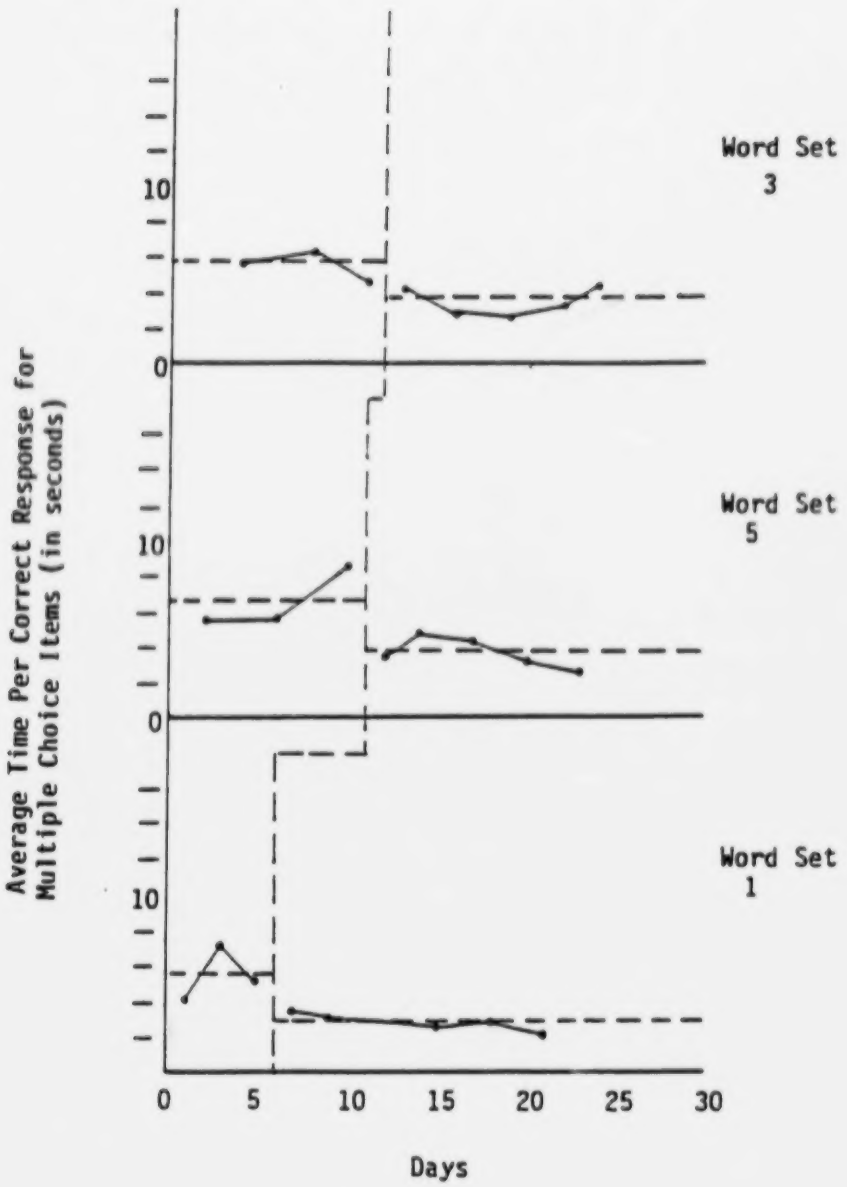

Figure 8: Student C.: Average Time-Multiple Choice Items

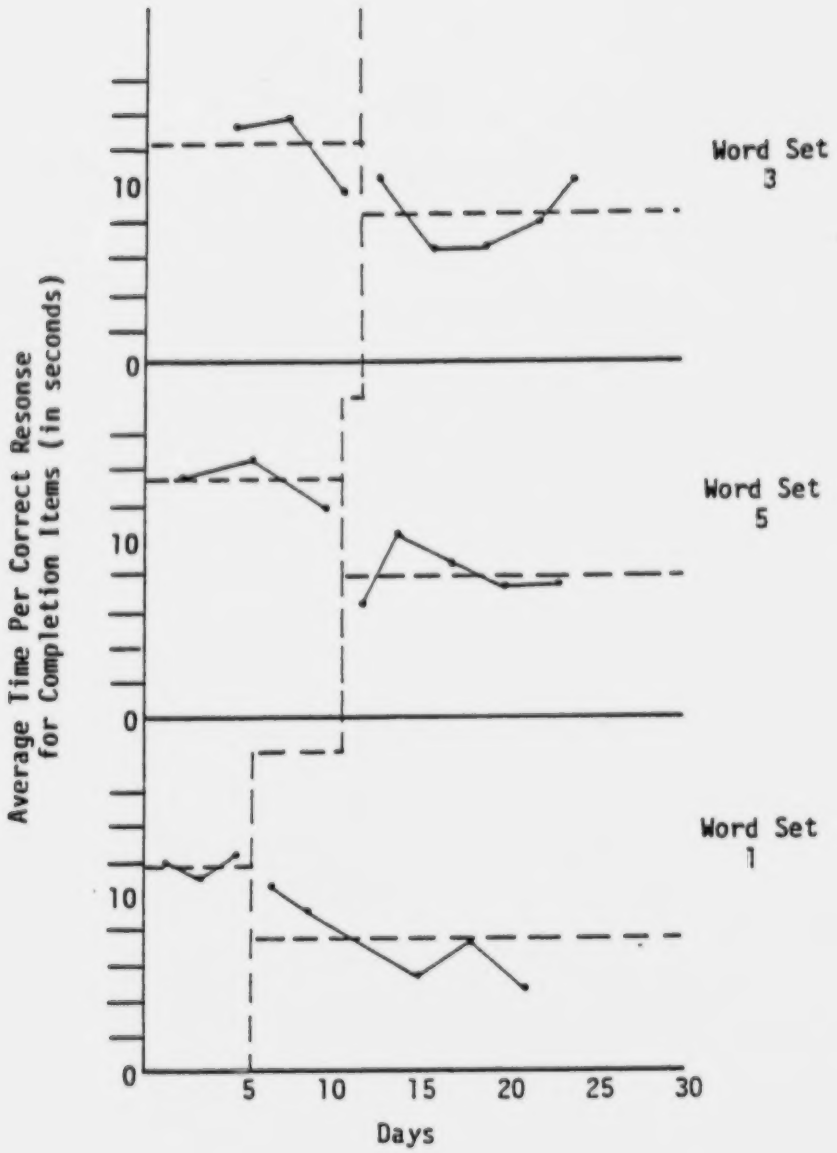

Figure 9: Student C: Average Time
Completion Items

Student D

Student D was a 38 year-old black male from an urban home. He was monolingual in English and had attended ten years in an ungraded school. He had just begun attending ABE classes in the prison. His WRAT reading subtest score was 2.4 while his composite score was also 2.4. His SORT grade level was 3.4 but due to the amount of time he took in completing the reading, this score may not be viewed as valid. Student D had sustained an undetermined amount of brain damage as a result of an automobile accident. His speech was noticeably slowed and he appeared to have problems concentrating on a task. He completed 22 hours of work with the courseware.

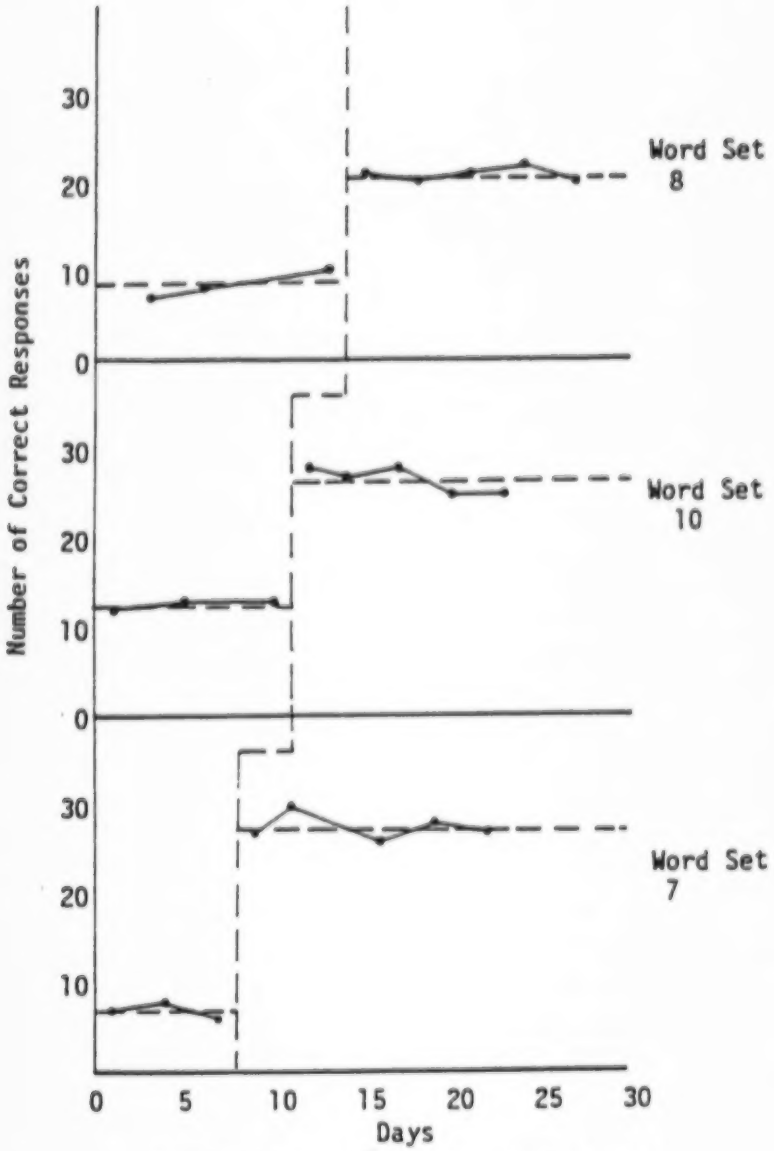

Figure 10: Student D: Number of Correct Responses

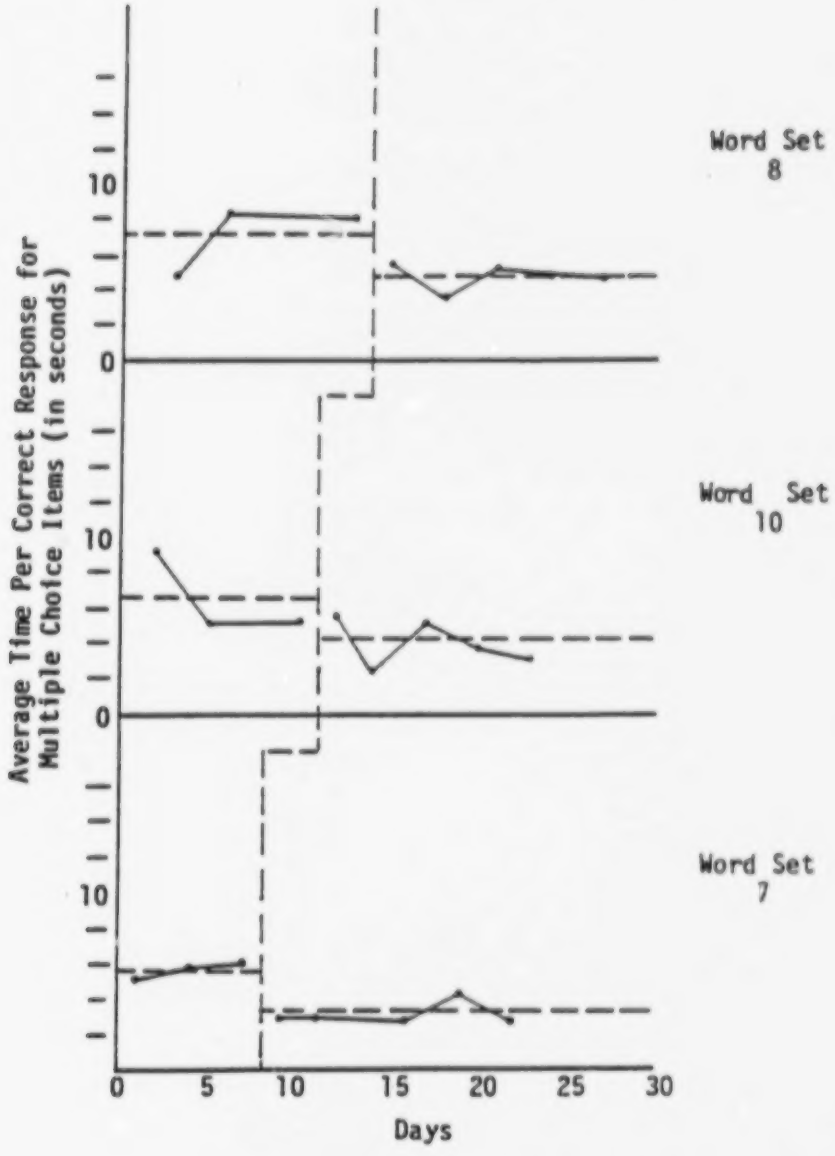

Figure 11: Student D: Average Time Multiple Choice Items

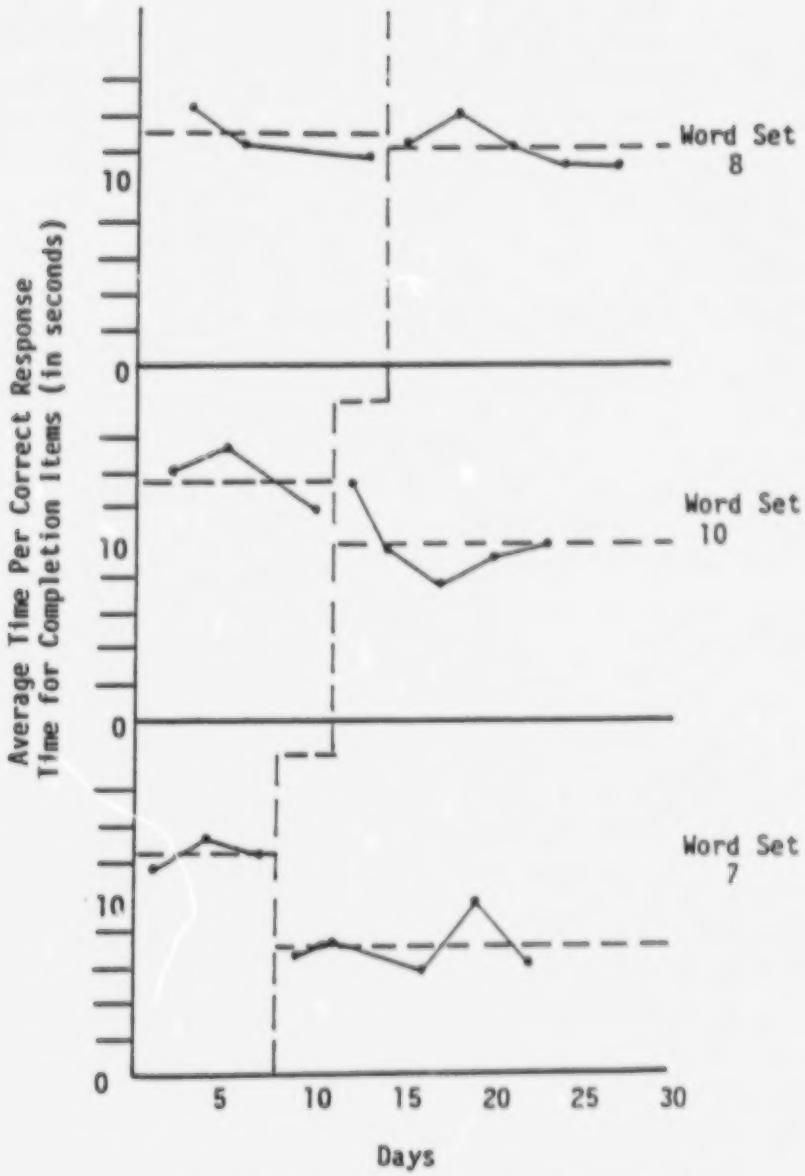

Figure 12: Student D: Average Time Completion Items

Student E

Student E was a 57 year-old white male from an urban home. He spoke Spanish as his home language and English as a second language. According to the LAB, Student E's reading skills in both Spanish and English were very poor. Using the Level II form of the test, he performed in the second stanine in both languages. He reported that he had not attended school as a child. He had attended ABE classes for about three weeks at the prison. His WRAT reading subscore was 2.1 while his composite score was 2.6. His SORT grade level score was 0.9. He had a moderate hearing loss but was able to use the courseware effectively if he used headphones. He completed 25 hours of work with the courseware.

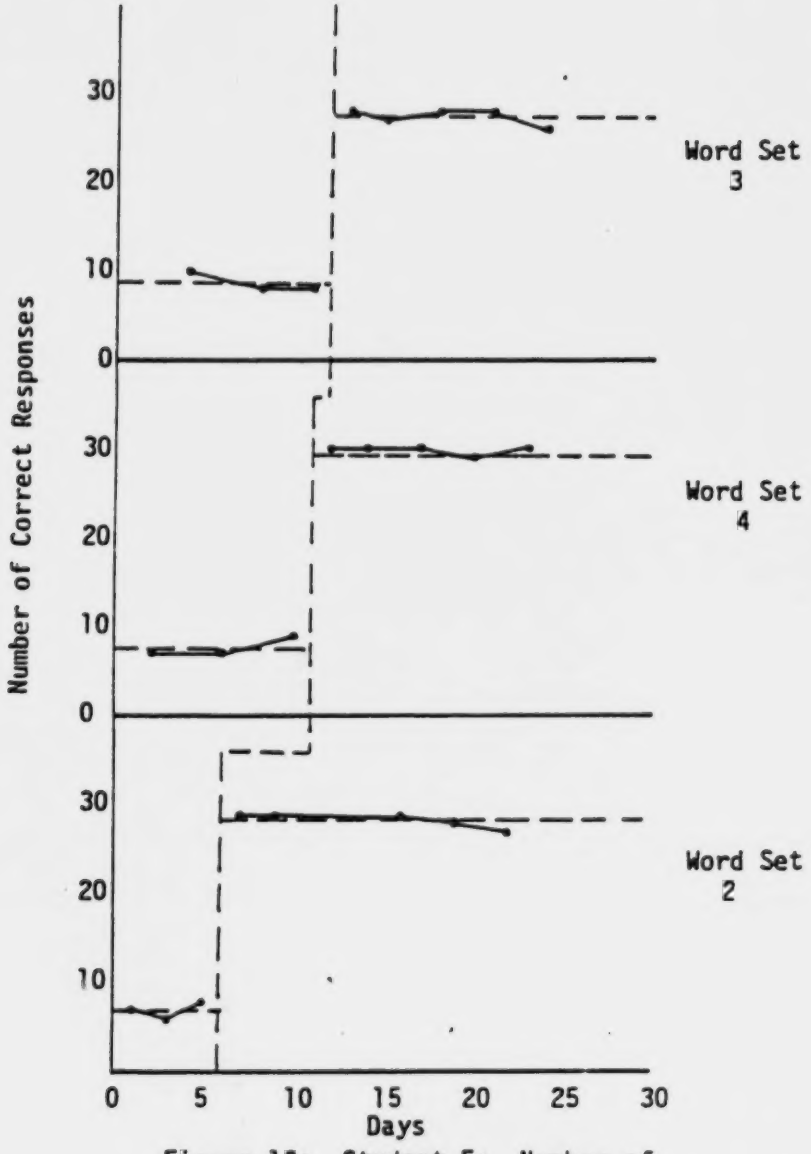

Figure 13: Student E: Number of Correct Responses

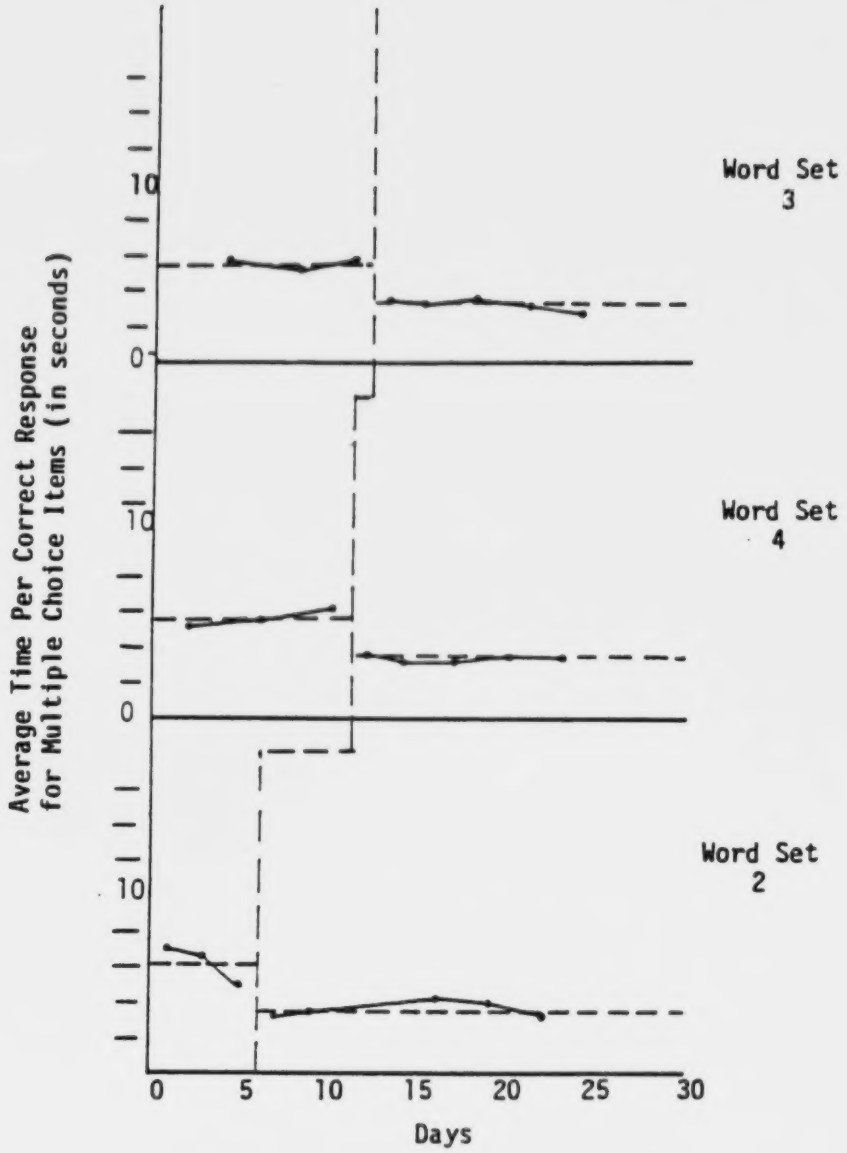

Figure 14: Student E: Average Time - Multiple Choice Items

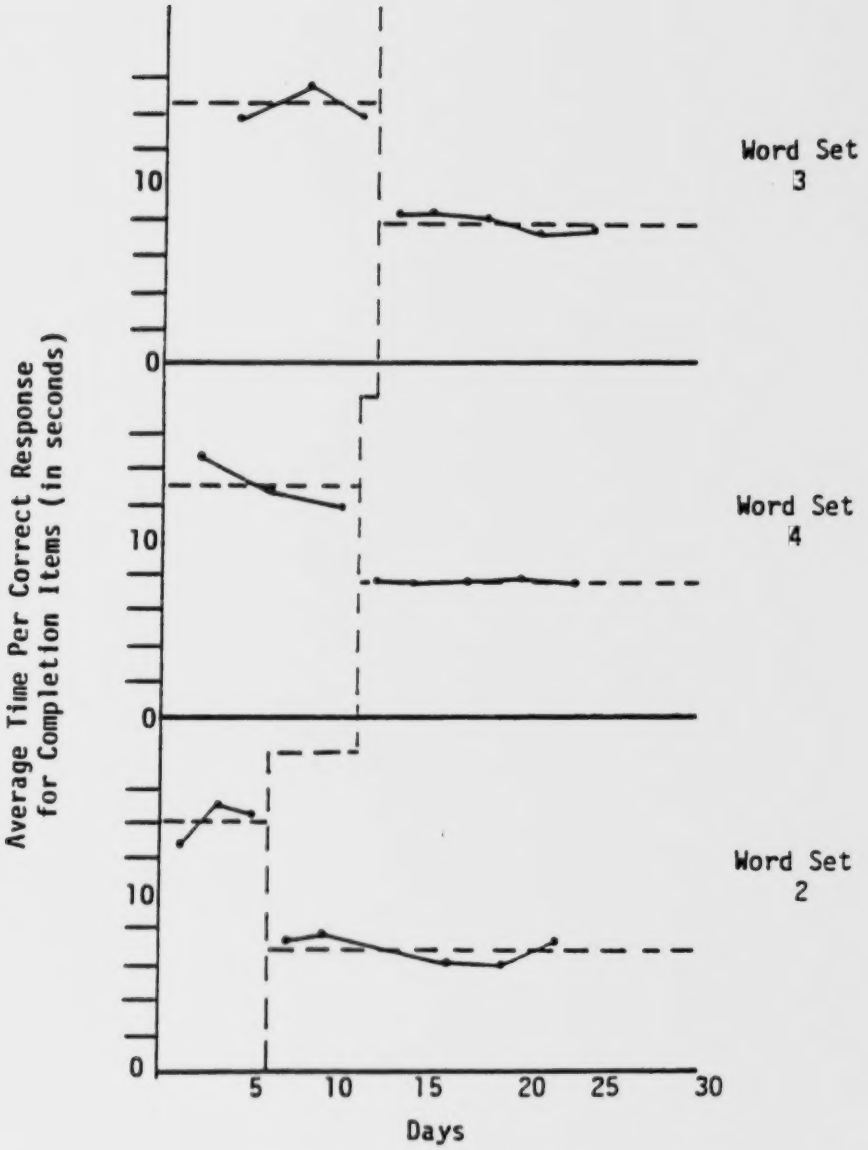

Figure 15: Student E: Average Time
Completion Items

Student F

Student F was a 26 year-old white male from an urban home. He spoke Spanish as his home language and English as a second language. According to the LAB, Student F's reading skills in Spanish were stronger than those in English. Using the Level II form of the test, he performed in the seventh stanine in Spanish and in the third stanine in English. He had completed the ninth grade in school. He had attended about three months of ABE classes at the prison. His WRAT reading subscore was 2.1 while his composite score was 2.3. His SORT grade level score was 2.0. He completed 22 hours of work with the courseware.

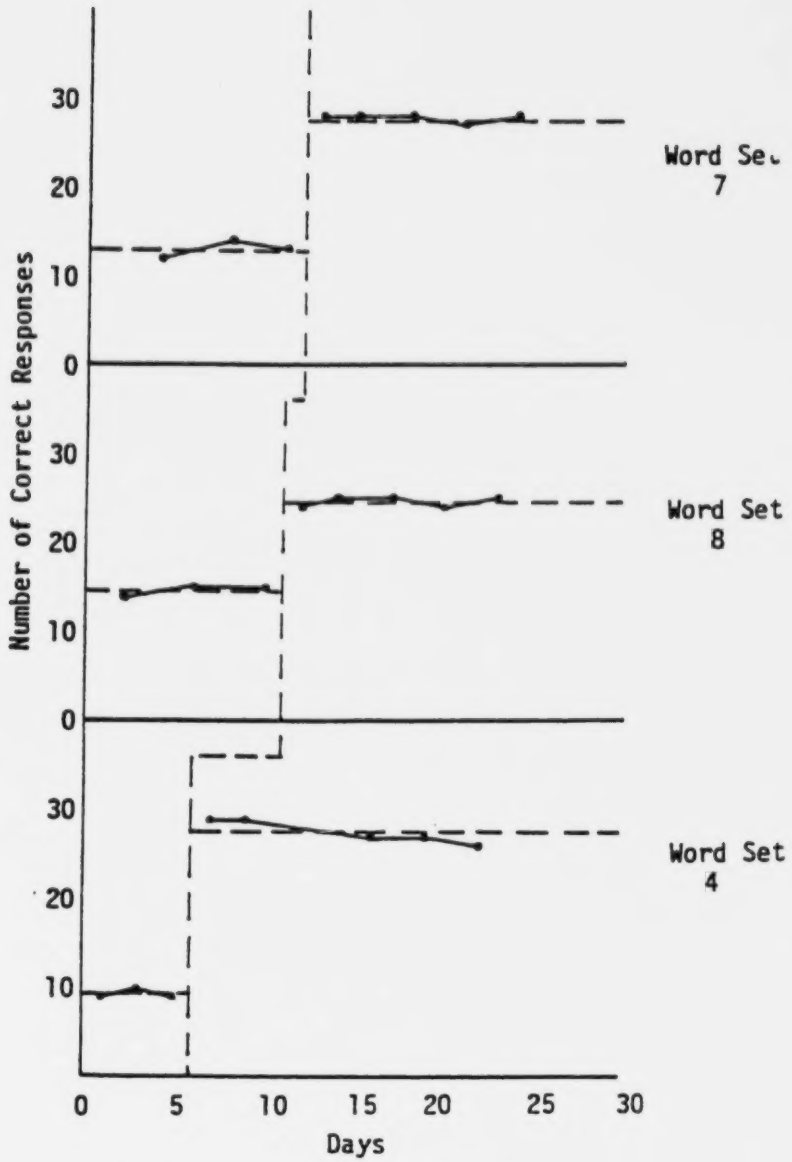

Figure 16: Student F: Number of Correct Responses

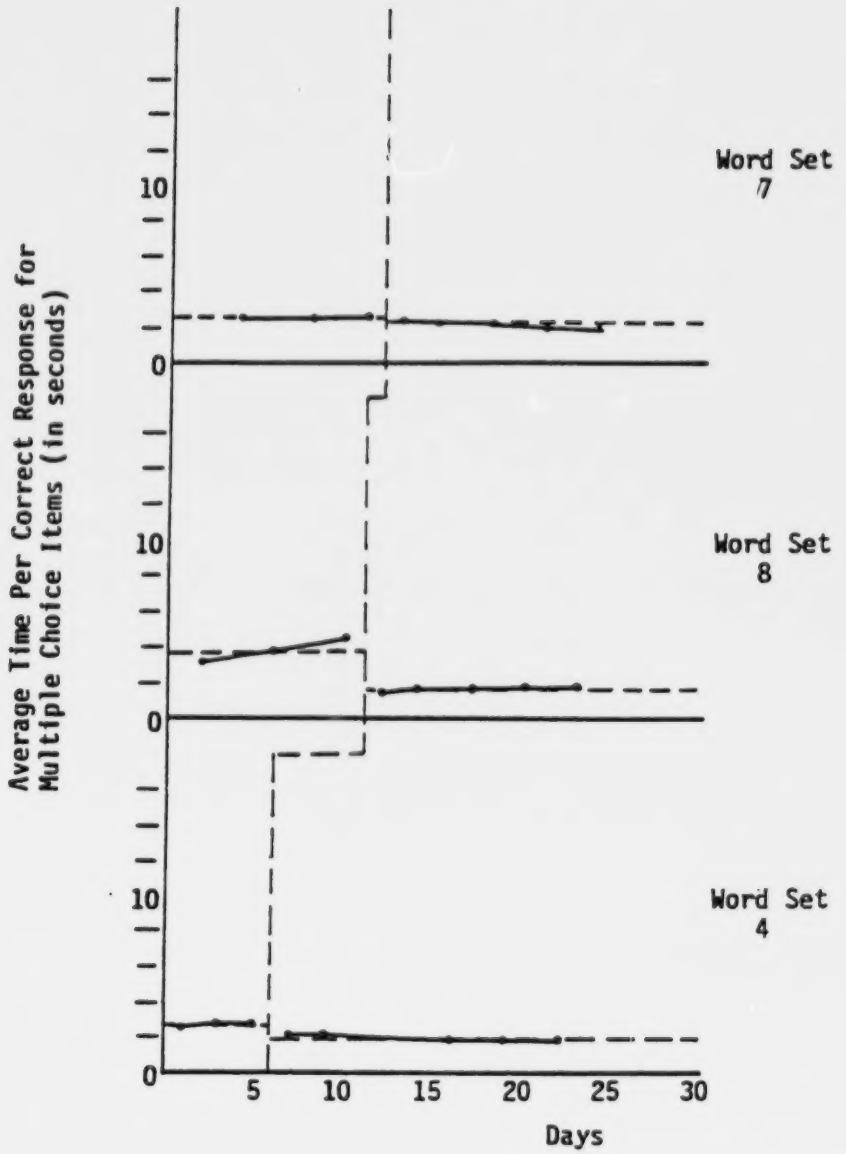

Figure 17: Student F: Average Time Multiple Choice Items

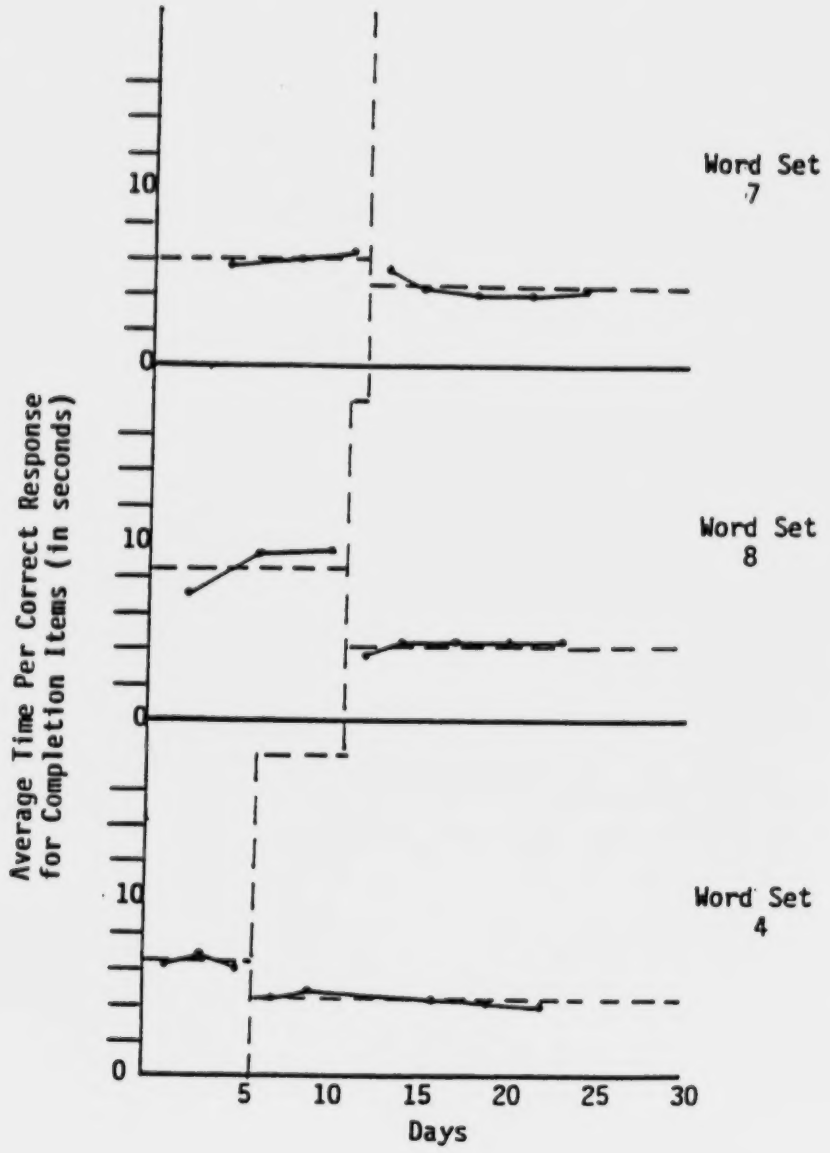

Figure 18: Student F: Average Time - Completion Items

Student G

Student G was a 22 year-old male from a rural home. He was monolingual in English and had completed the ninth grade of a Special Education program in school. He had completed about one year of ABE classes in the prison. His WRAT reading subtest score was 3.4 while his composite score was ?). His SORT grade level score was 2.4. He completed 23 hours of work with the courseware.

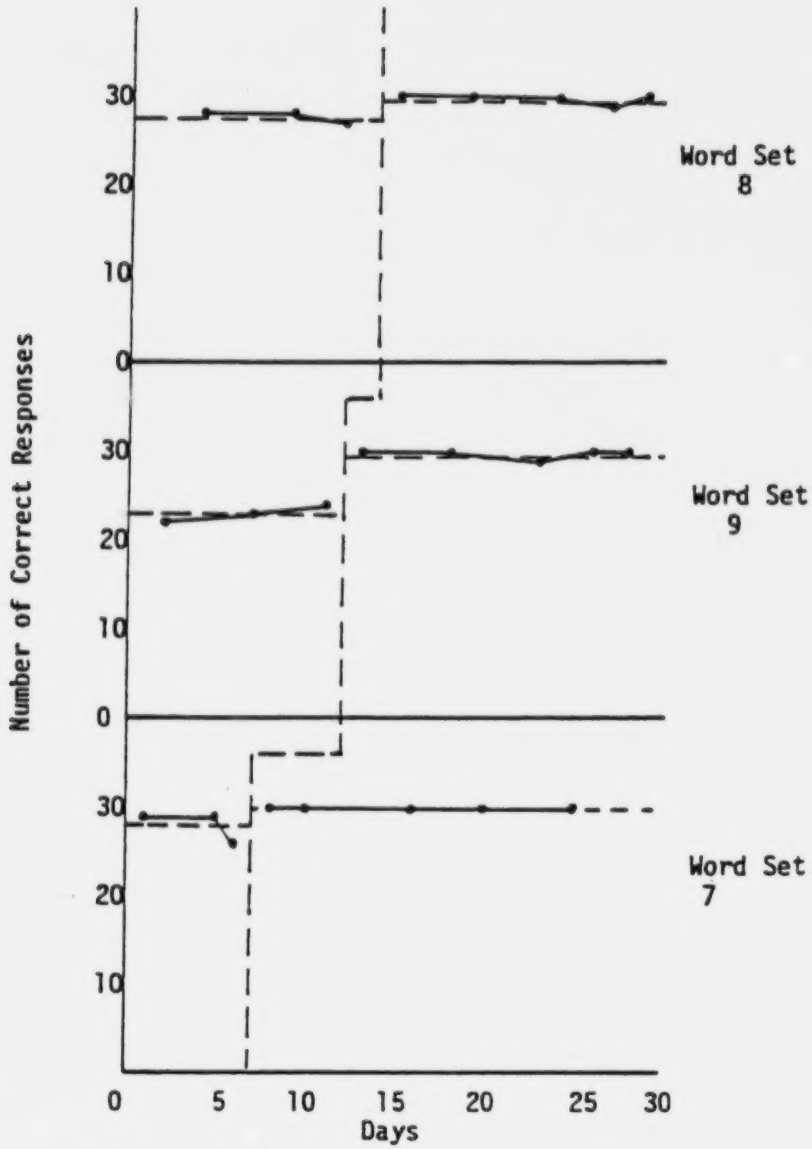

Figure 19: Student G: Number of Correct Responses

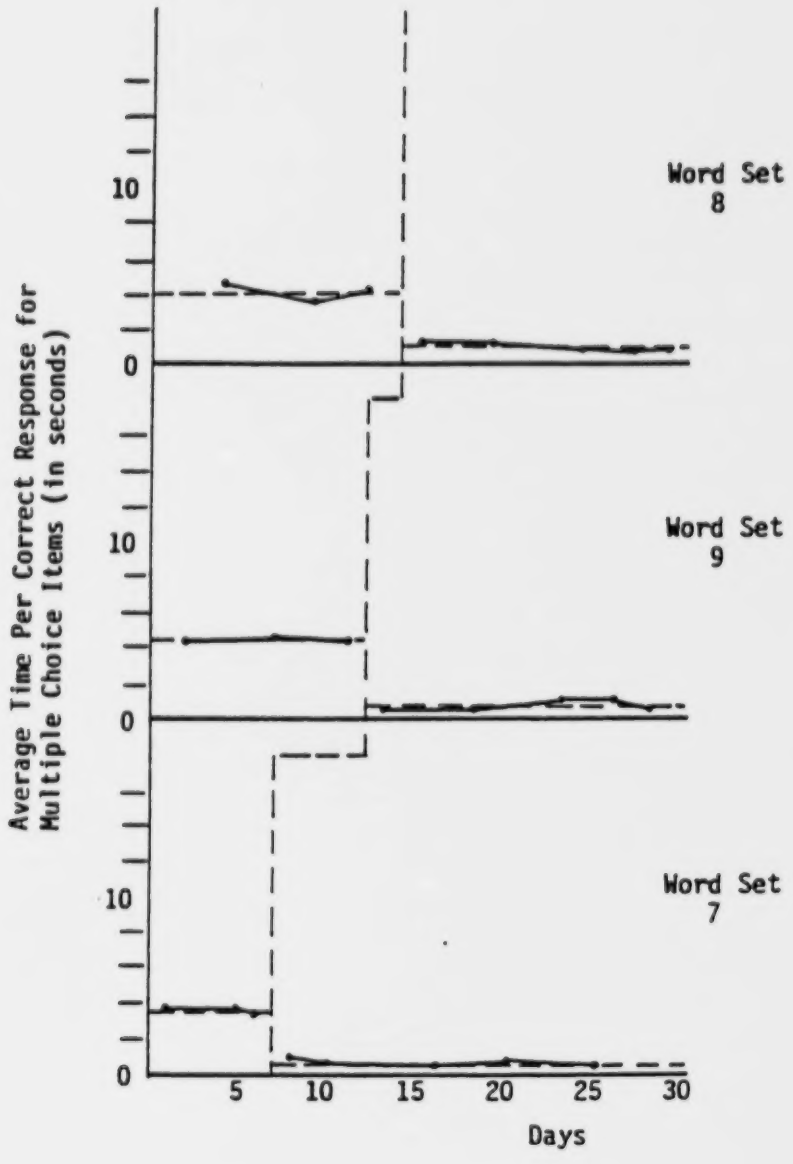

Figure 20: Student G: Average Time Multiple Choice Items

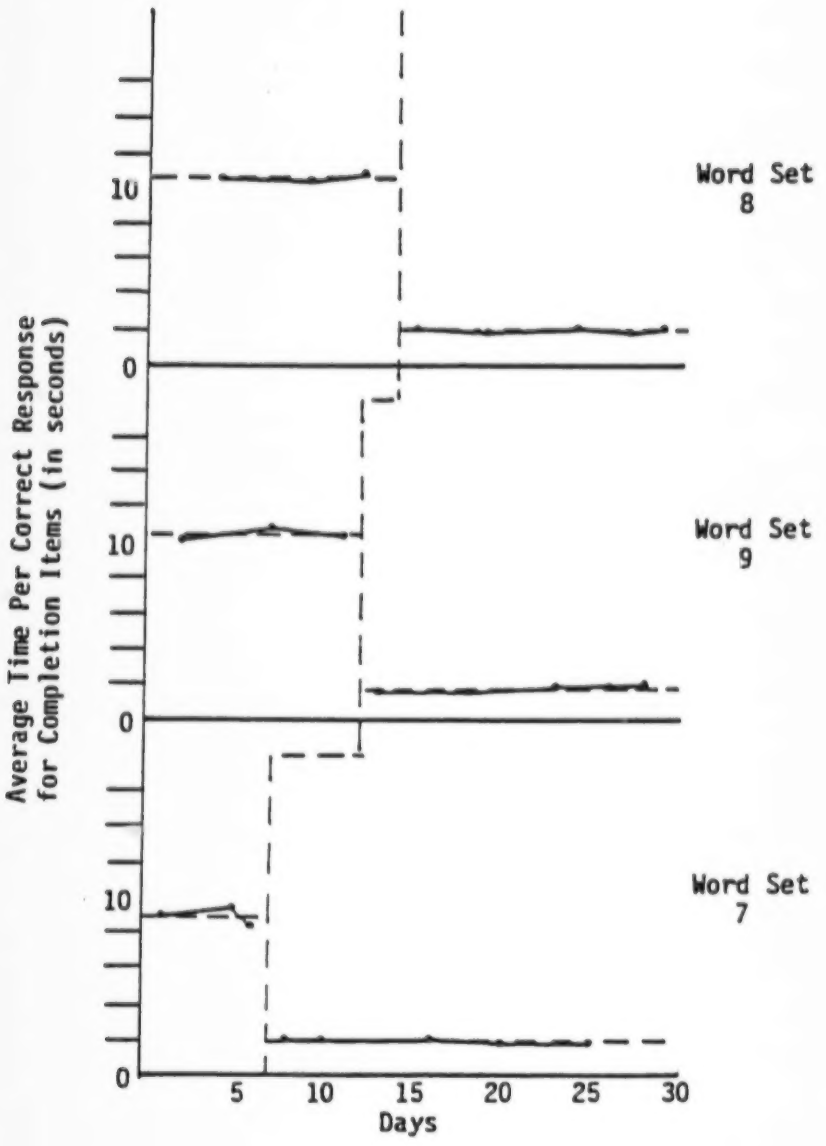

Figure 21: Student G: Average Time Completion Items

Student H

Student H was a 30 year-old black male from an urban home. He was monolingual in English and had completed the eleventh grade in school. He had completed about three months of ABE classes in the prison. His WRAT reading subtest score was 2.4 while his composite score was 2.5. His SORT grade level score was 0.8. He completed 25 hours of work with the courseware.

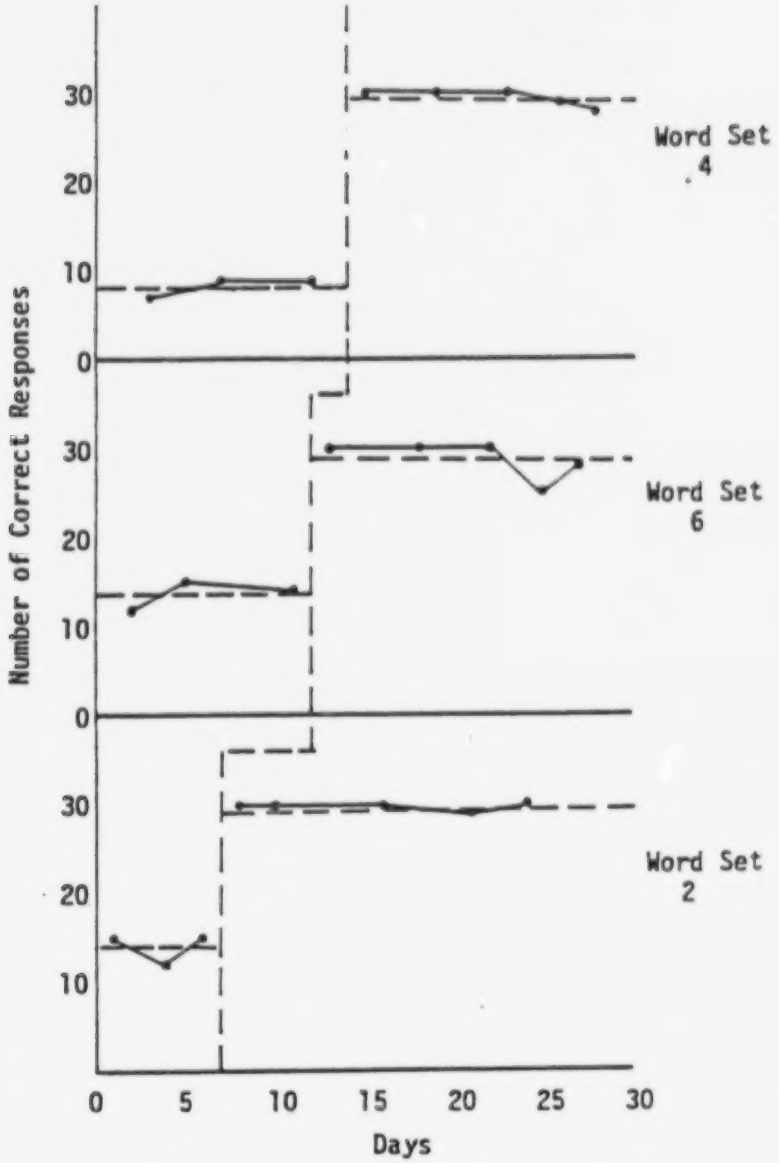

Figure 22: Student H: Number of Correct Responses

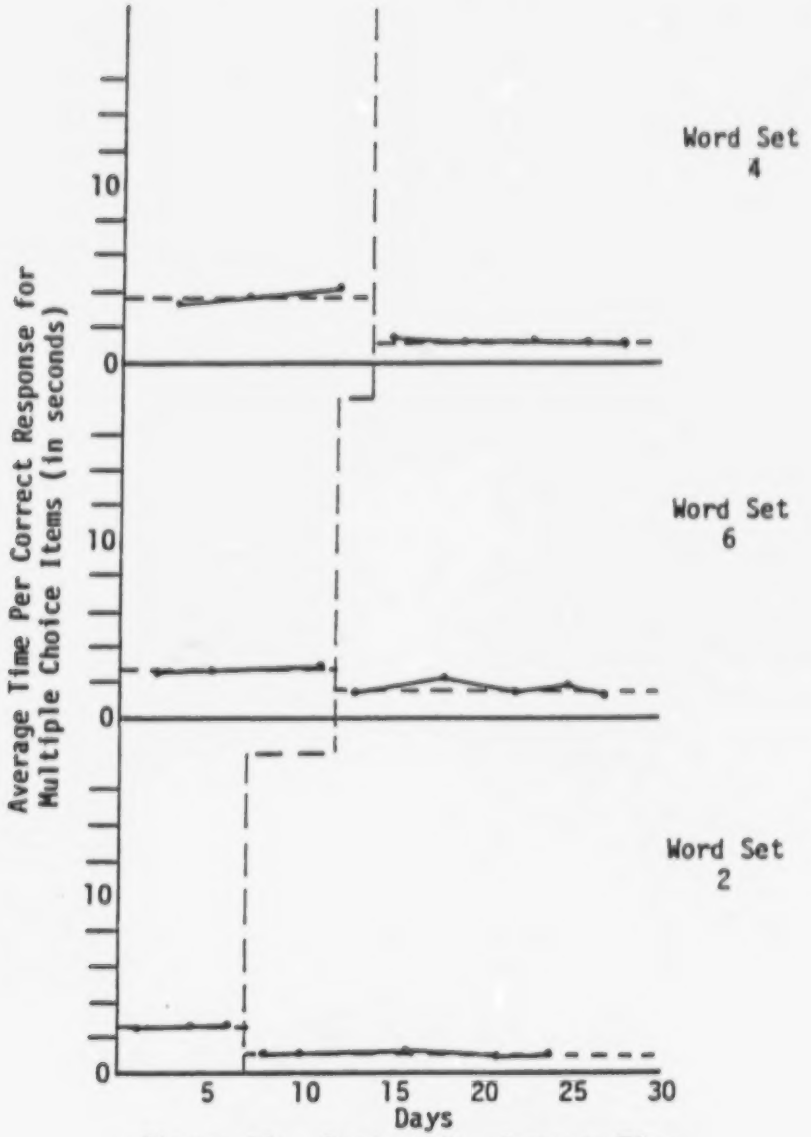

Figure 23: Student H: Average Time
Multiple Choice Items

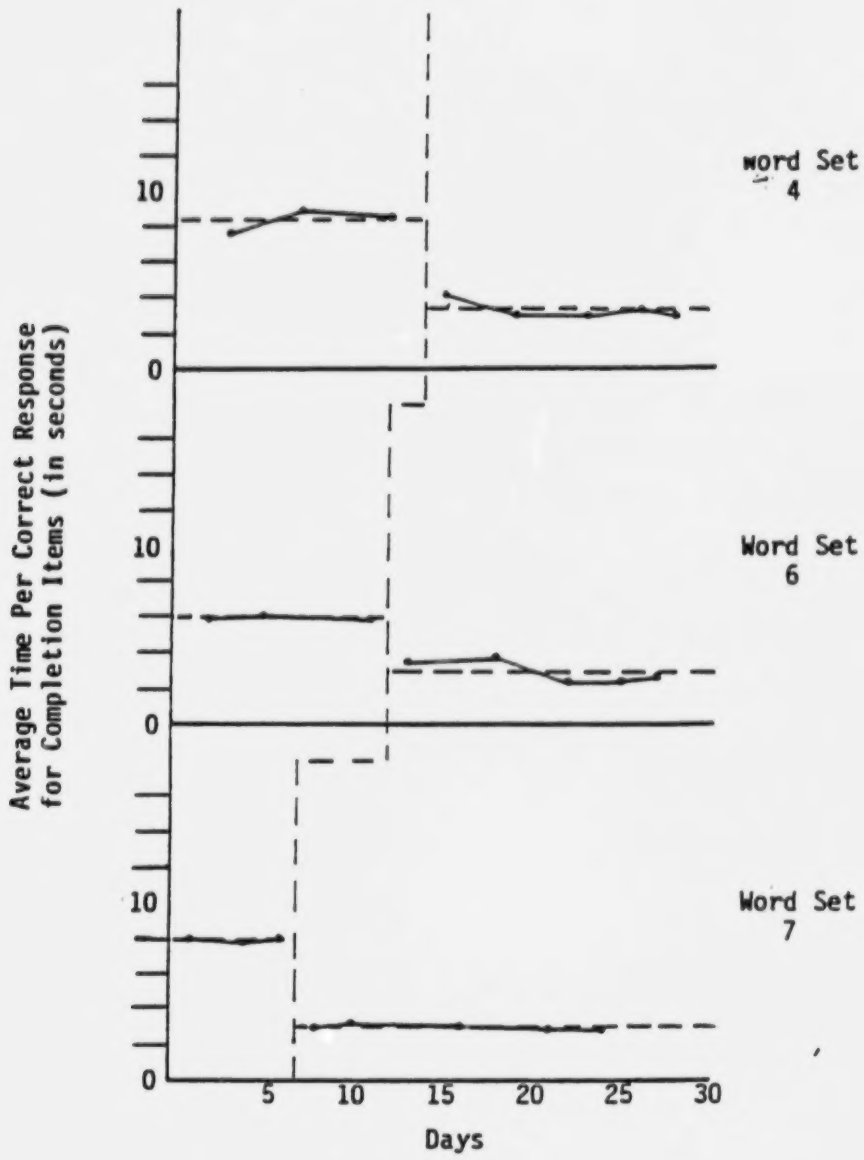

Figure 24: Student H: Average Time Completion Items

Student I

Student I was a 29 year-old white male from a rural home. He was monolingual in English and had completed the fifth grade in school. He had completed about two years of ABE classes in the prison. His WRAT reading subtest score was 3.3 while nis composite score was 2.7. His SORT grade level score was 2.3. He completed 25 hours of work with the courseware.

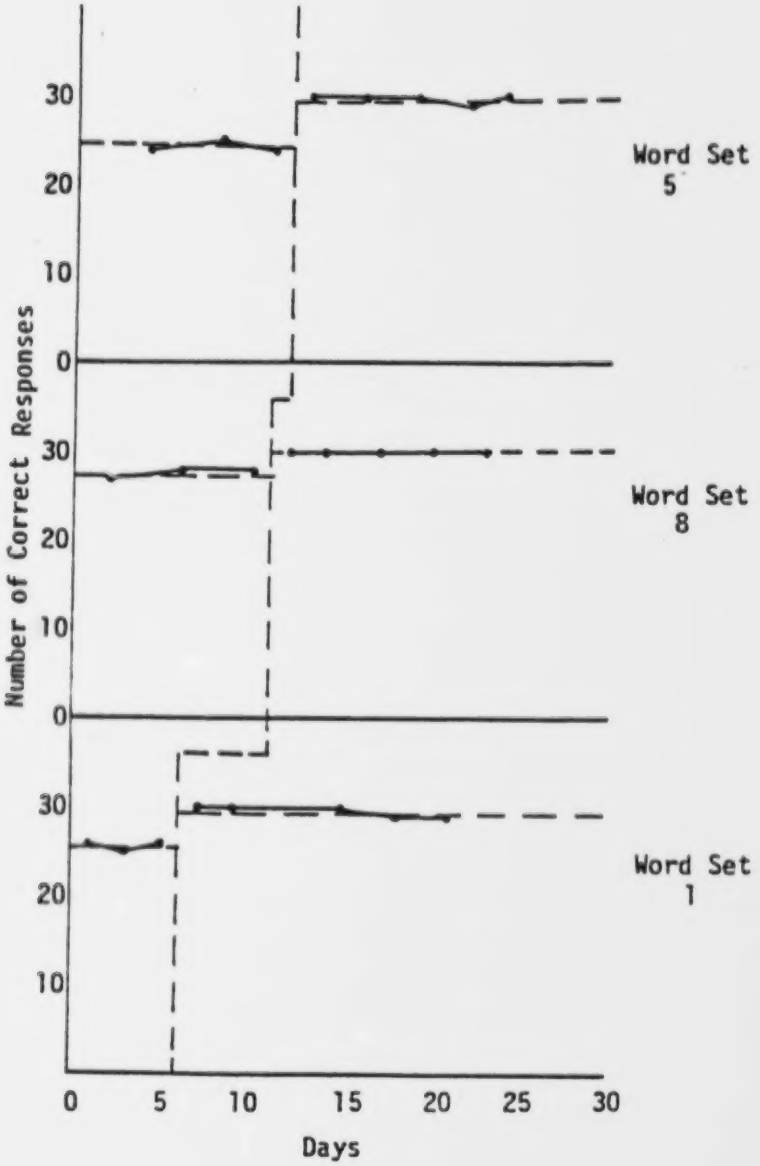

Figure 25: Student I: Number of Correct Responses

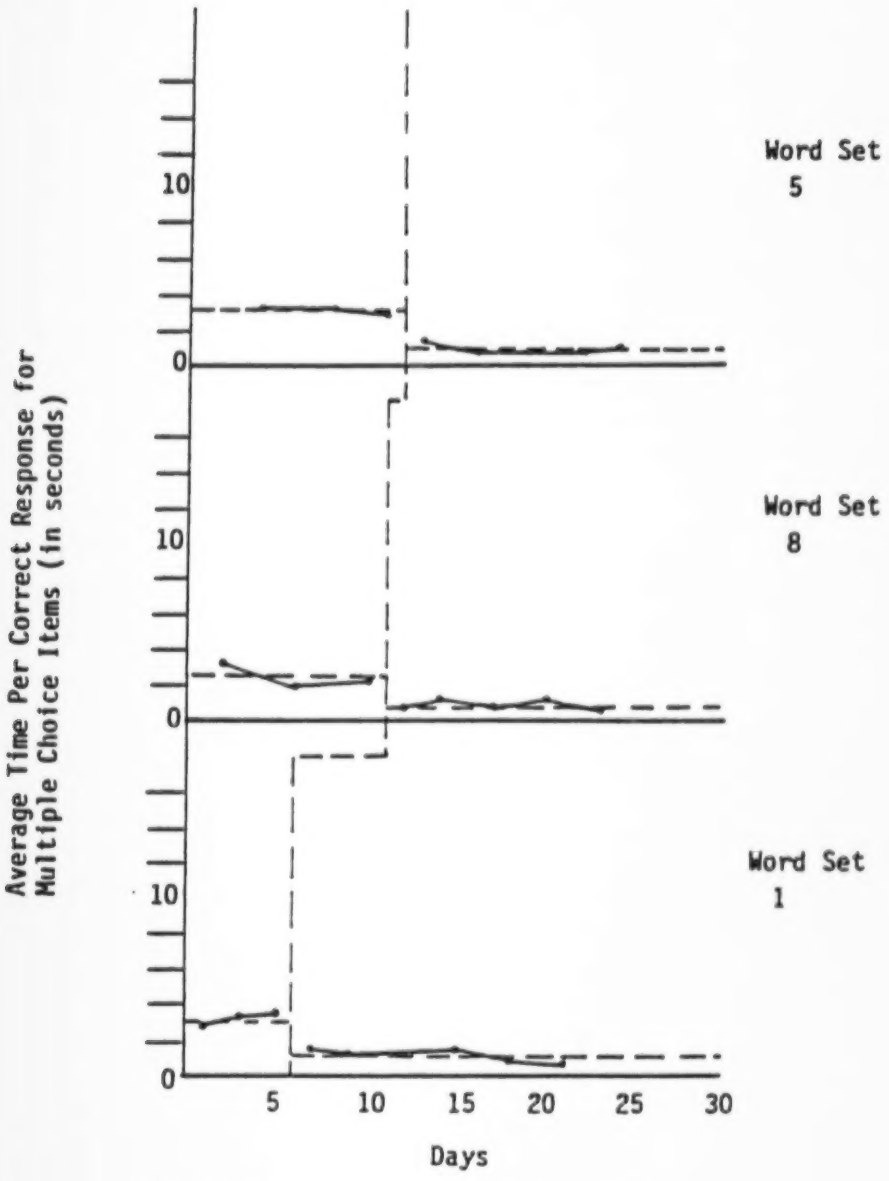

Figure 26: Student I: Average Time-Multiple Choice Items

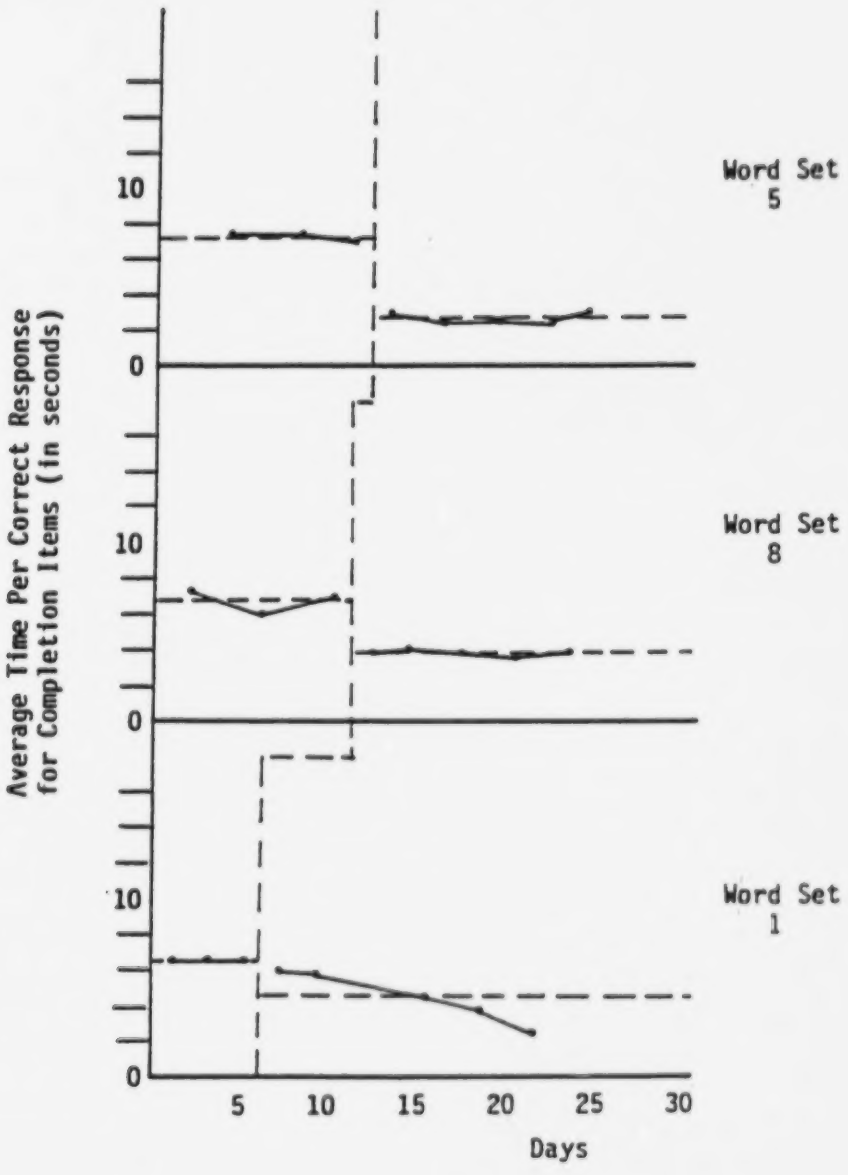

Figure 27: Student I: Average Time Completion Items

Student J

Student J was a 30 year-old black male from an urban home. He was monolingual in English and had completed the eleventh grade in school. He had completed about ten months of ABE classes in the prison. His WRAT reading subtest score was 2.3 while his composite score was 3.1. His SORT grade level score was 0.5. Due to his work schedule at the prison, he was not able to attend all of the scheduled sessions. In addition, Student J worked more slowly than any of the other subjects. For these reasons, he was unable to complete three target lessons. Therefore only two baselines are reported for Student J. He completed 18 hours of work with the courseware.

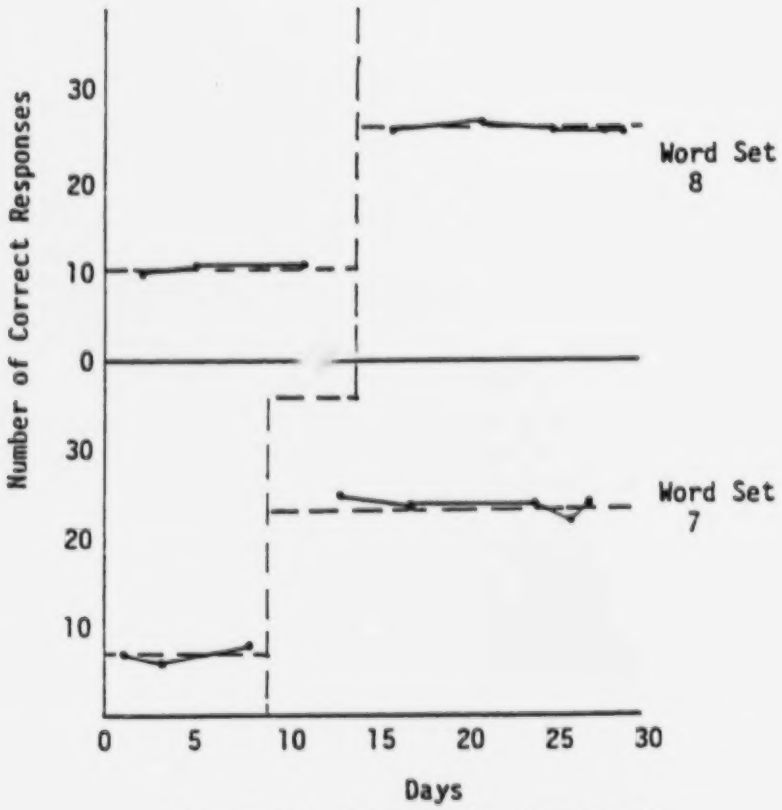

Figure 28: Student J: Number of Correct Responses

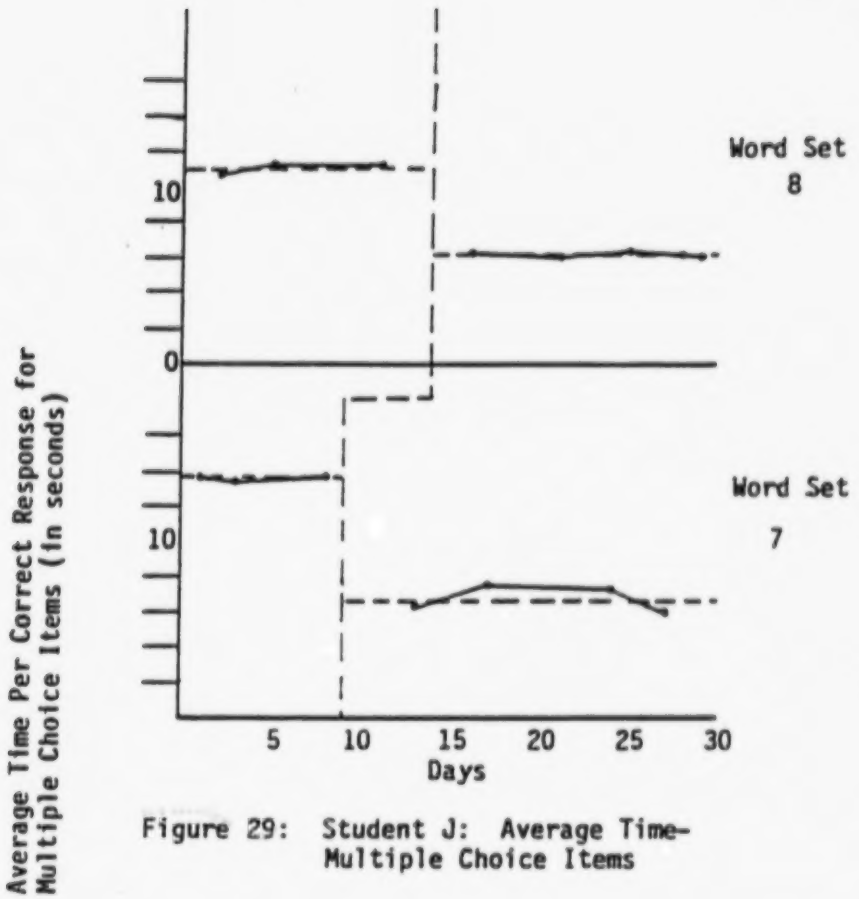

Figure 29: Student J: Average Time-Multiple Choice Items

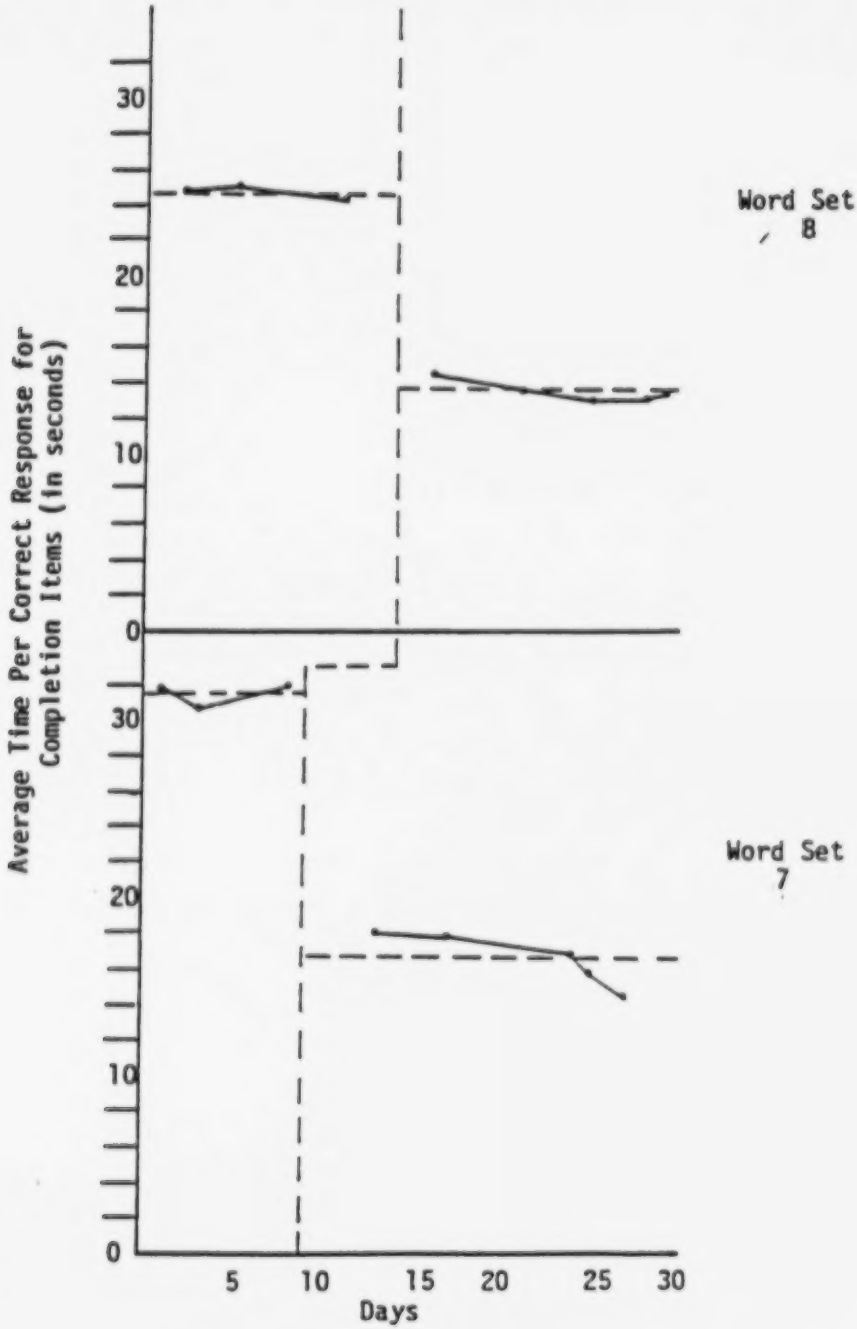

Figure 30: Student J: Average Time Completion Items

Student K

Student K was a 23 year-old black male from an urban home. He was monolingual in English and had completed the tenth grade in school. He had attended about nineteen months of ABE classes in the prison. His WRAT reading subtest score was 2.7 while his composite score was also 2.7. His SORT grade level score was 2.2. He completed 22 hours of work with the courseware.

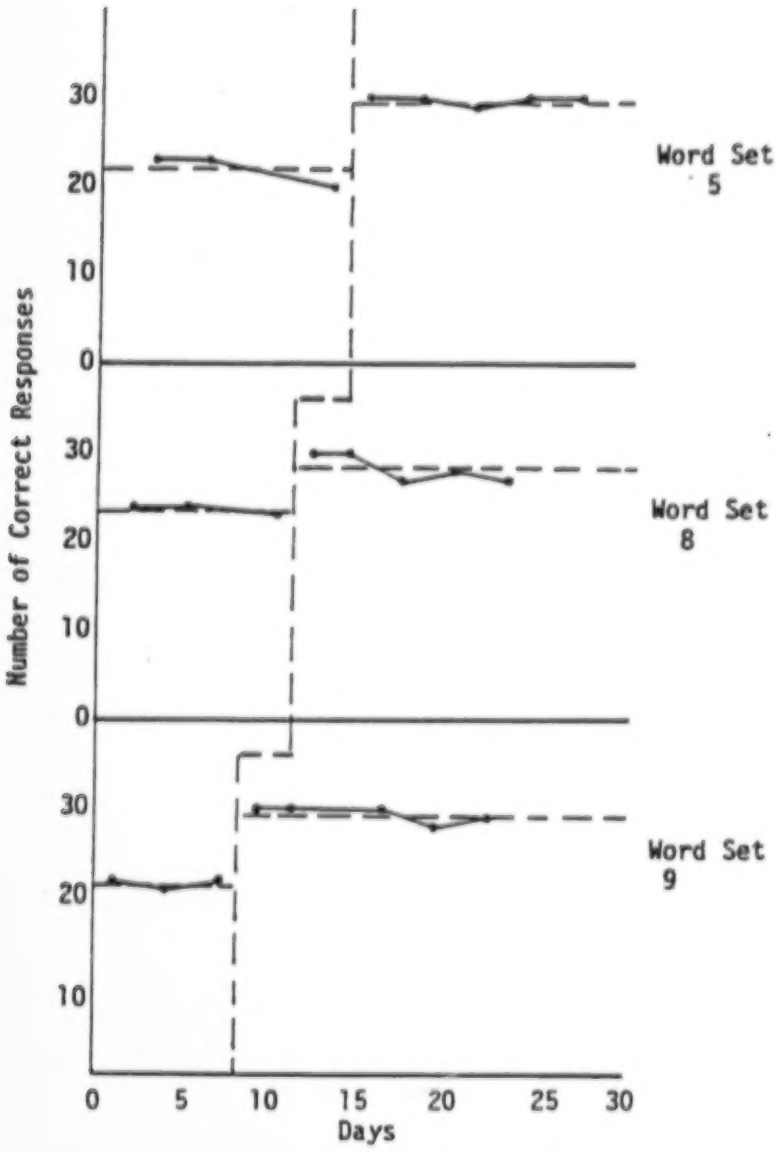

Figure 31: Student K: Number of Correct Responses

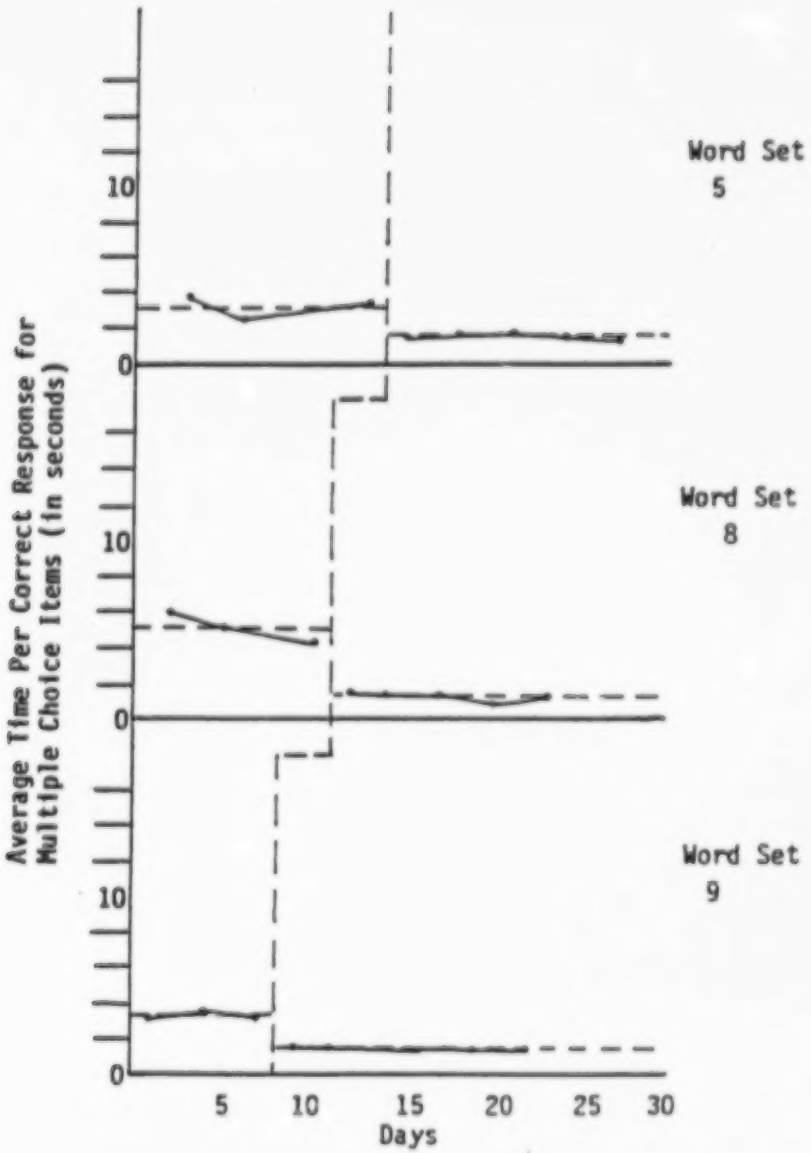

Figure 32: Student K: Average Time-Multiple Choice Items

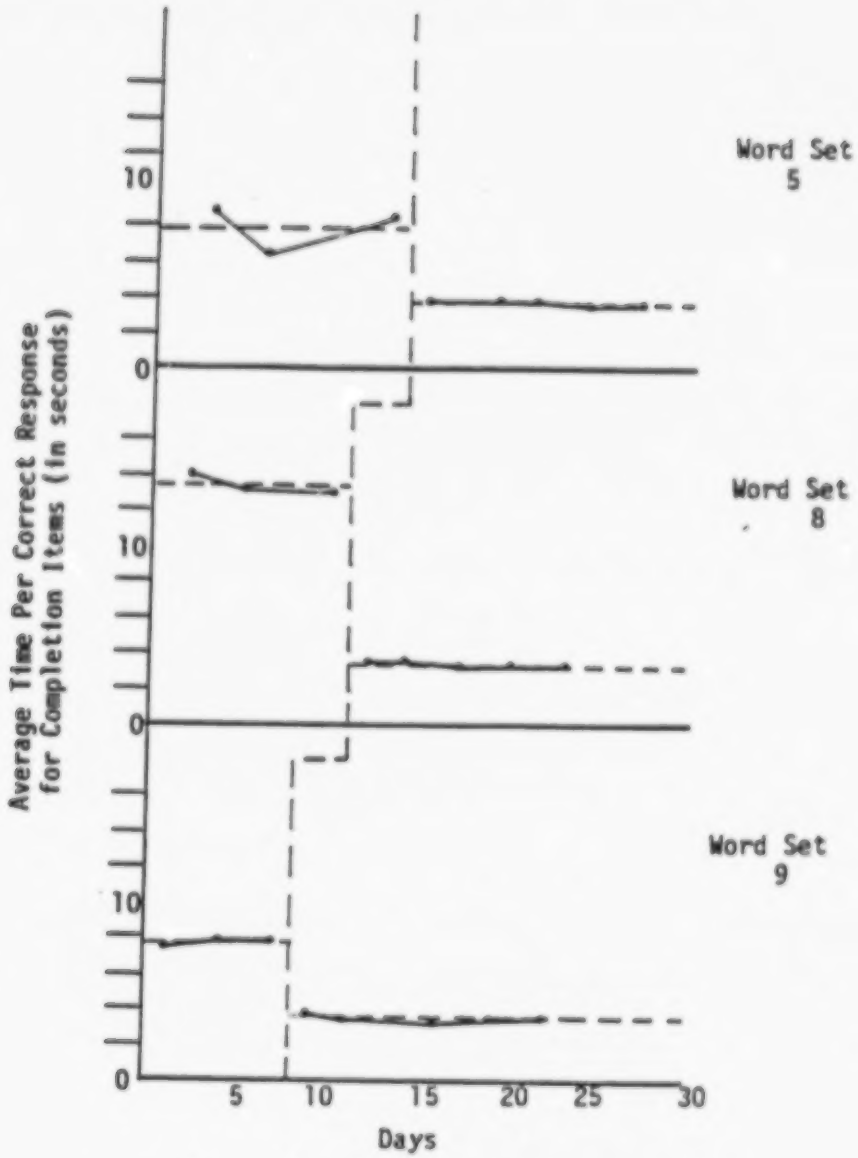

Figure 33: Student K: Average Time - Completion Items

GROUP COMPARISON STUDY

In the second phase of the evaluation, a traditional experimental-control group design was used. A group of twenty-seven inmates was tested using two sections of the Baltimore County Design (Words in Isolation and Words in a Functional Setting), the Bader Reading and Language Inventory (an informal reading inventory), the Slosson Oral Reading Test and a test of incidental learning of computer words. The Wide Range Achievement Test scores of these men were also reviewed. The WRAT scores were used to verify that the experimental and control groups were equivalent in terms of reading skills.

Procedures

During this six-week phase, the men in the experimental group were assigned to one-hour per day sessions with the microcomputer. The courseware was moved to a different room in the education building where only two microcomputers were available. Due to prison work assignments and lock-up procedures, not all of the men were able to attend all of their sessions. They did use the lessons for 10-22 hours.

During this time, the control group received small group and tutorial instruction in traditional beginning materials for adult reading instruction. The control group had no exposure to the CAI lessons.

This phase of the evaluation involved as little as possible direct interaction of project staff with the students. The use of the courseware was coordinated by the classroom teacher and an inmate teacher-aide.

Following the six weeks, the remaining twenty-three men were again post-tested using the same measures. The pretest and posttest scores were analyzed using analysis of variance for repeated measures. This type of test allows a researcher to look at the interaction between time of measurement and treatment (Borg and Gall, 1983). It is used to decide whether the difference between the pr

test and posttest means of the experimental group is significantly greater or less than the difference (gain) for the control group.

Results

In this study, the results of the statistical tests showed growth on all measures. However, the only measure which showed a statistically significant difference was the Bader Reading and Language Inventory. The Bader is an individualized reading inventory which yields a reading grade level score. These grade levels were converted to a numerical value (e.g., Pre-primer level equals o, Primer level equals 1, first grade level equals 2, etc.). These numerical values were then used for statistical analysis. This measure showed remarkable change n the pre-/posttest scores of the experimental group. The means of these groups are summarized in the following table:

Table 1: Mean Score of Pre-/Posttest on the Bader

	Pretest Mean	Posttest Mean
Experimental Group	0.08	0.92
Control Group	0.40	0.30

A mean score of 0.07 in the pretest indicates that the experimental group was reading on a low pre-primer level. The posttest score of 0.92 indicates that the experimental group was now reading close to a primer level. While the control group was reading significantly better than the experimental group on the pretest measure, they showed no improvement on the posttest measure and had fallen behind the experimental group by this time. These results are surprising as we would expect the greatest effect of a word recognition program to be on tests consisting of word lists. The greatest impact, however, was a global measure of reading ability an informal reading inventory. Apparently, the subjects in this study were able to transfer vocabulary learned in the CAI programs to a print reading task. The ability to recognize words in new settings, of course, is the goal of all reading instruction. This goal appears to have been achieved in this study.

CONCLUSIONS

The use of the courseware appeared to be quite successful in both studies. As anticipated, the multiple baseline design appears to be much more sensitive to the learning which took place although this growth was also apparent in the group comparison study.

One observation which was made by the prison's education staff was the level of interest and enthusiasm shown by the students. Most of the men attended their sessions regularly, often coming early hoping for a chance to work on the microcomputer. In interviews at the end of each phase, the most common complaint was that they (i.e., the students) wanted more time to work with the courseware.

The speech synthesizer did not prove difficult for these students. Even the hearing-impaired Hispanic student, 57 years old, made dramatic progress in the multiple baseline study.

Students from the multiple baseline study were tested for long-term retention of the target words by having them read a word list. All eleven men who participated in the multiple baseline study were tested ten months later; the retention level was excellent, about 90 percent. Apparently, once the words were learned by CAI they were retained.

The two studies were designed to measure the effectiveness of the courseware in two types of instructional settings. In the multiple baseline study project investigators were involved in daily monitoring of instruction. In the group comparison study the courseware was used naturalistically in the classroom with very limited monitoring and intervention from project staff. In both settings the courseware was used effectively with inmate aides assuming much responsibility for printing student records and doing other routine tasks involved in using the courseware. Neither teacher would be considered a "computer expert." The

courseware appears to be not only feasible but also effective as an instructional tool within an adult basic education classroom.

References

Borg, W. R. and Gall, M. D. (1983). Educational research: An Introduction. Longman: New York.

Harman, D. (1985). Turning illiteracy around: An agenda for national action. Working Paper No. 2. New York: Business Council for Effective Literacy.

APPENDIX

Table 1: Mean Scores for Students in Multiple Baseline Study (Number of Correct Responses)

Students	Number of Correct Responses					
	First Target Lesson		Second Target Lesson		Third Target Lesson	
	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase
A	6.3	29.3	15.7	28.2	12.2	29.2
B	21.0	29.8	21.7	28.8	22.3	29.2
C	9.7	29.2	14.7	29.8	11.0	28.4
D	7.0	27.6	12.7	26.6	8.3	20.8
E	7.0	28.4	7.7	29.8	8.7	27.4
F	9.3	27.6	14.7	24.6	13.0	27.8
G	28.0	30.0	23.0	29.8	27.7	29.8
H	14.0	29.8	13.7	28.6	8.3	29.4
I	25.7	29.6	27.7	30.0	24.3	29.8
J	7.0	23.8	10.7	26.2		
K	21.7	29.4	23.7	28.4	22.0	29.8

Table 2: Mean Scores for Students in Multiple Baseline Study (Average Time per Correct Response on Multiple Choice Items)

Students	Average Time Per Correct Response (Multiple Choice Items)					
	First Target Lesson		Second Target Lesson		Third Target Lesson	
	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase
A	5.6	1.8	3.7	1.7	3.6	1.8
B	3.1	1.1	3.7	1.0	3.4	1.3
C	5.6	2.9	6.6	3.7	5.5	3.5
D	5.7	3.2	6.5	4.1	7.0	4.8
E	6.2	3.5	5.7	3.3	5.7	3.3
F	2.7	2.0	3.8	1.7	2.6	2.2
G	3.6	0.6	4.5	0.8	4.1	1.0
H	2.7	1.2	2.8	1.7	3.8	1.2
I	3.1	1.2	2.5	0.9	3.1	1.0
J	13.5	6.7	10.9	6.1		
K	3.2	1.4	5.1	1.3	3.3	1.7

Table 3: Mean Scores for Students in Multiple Baseline Study (Average Time per Correct Response on Completion Items)

Students	Average Time for Correct Response (Completion Items)					
	First Target Lesson		Second Target Lesson		Third Target Lesson	
	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase	Pretest Phase
A	9.7	4.6	9.3	4.8	9.4	4.8
B	7.8	2.9	7.0	2.9	6.8	3.4
C	11.7	7.4	13.3	8.0	12.3	8.3
D	12.5	7.3	13.7	10.0	12.9	12.3
E	14.1	6.9	13.1	7.6	14.4	7.8
F	6.4	4.2	8.6	4.2	6.0	4.4
G	9.0	2.0	10.4	1.8	10.5	2.0
H	5.9	3.0	6.0	3.0	8.4	3.3
I	6.6	4.5	6.8	3.8	7.2	2.7
J	31.6	16.7	24.7	13.4		
K	7.8	3.5	13.4	3.4	7.9	3.8